Bidirectional Translation of Research Papers Related to Enhanced Methods for Oil Extraction

Grupo de Recobro Mejorado GRM and Semillero SETRA

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Undergraduate Thesis for Opting for the Title of B.A. in Foreign Language Teaching: English

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Dedicatoria

Agradecemos a la Universidad Industrial de Santander por brindarnos las herramientas y el conocimiento necesarios para el desarrollo de esta pasantía en traducción. Del mismo modo, al cuerpo docente y en especial a nuestra directora del presente trabajo de grado Heidy Alegría Gutiérrez Léon por su vital ayuda, dedicación y paciencia, así como al Profesor Adán Yovani Bermúdez León, por su acompañamiento y por permitirnos hacer parte de este proyecto. De igual manera a nuestras familias, compañeros y amigos por darnos ánimos y servirnos de apoyo para culminar esta etapa tan importante en nuestra formación profesional.

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Abstract

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Key Words: Scientific and Technical translation, oil extraction, translation approaches, pre-translation process.

Description: For this translation internship project two research articles were translated from English to Spanish and from Spanish to English doing direct and reverse translation, respectively; this in terms of the directionality in the translation. The translation type implemented was Scientific and Technical translation in the field of oil extraction industry with a hybrid technique of steam injection in Colombia. This internship project is carried out in support of the School of Petroleum Engineering at Universidad Industrial de Santander. As theoretical support, different approaches to translation were utilized such as Skopostheorie the Functionalist Approach (Nord, 1997), and Translation Techniques (Hurtado Albir, 2001). For the pre-translation process, we included three steps: 1) The translation brief. 2) The creation of a terminological bank (glossary). 3) Study of parallel texts in English and Spanish. Finally, during the translation process, different linguistic challenges were encountered both in the source texts and when doing the translations. Such challenges were dealt with by using coping strategies including the use of online and specialized dictionaries and concordances as well as the use of corpora (parallel texts) for comparison and reference. These translation processes as a research internship will help to strengthen the investigative and productive capacity of research groups. By the means of translation, research groups can disseminate their products and collaborate in the formation of networks of scientific knowledge. The products of the translation of scientific articles are, generally speaking, published in indexed international journals. Moreover, this translation project will serve as a guide for future investigations in the field of oil recovery in the Colombian context, as well as for similar internship projects in the field of translation Scientific and Technical with a functionalist approach.

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Resumen

Título: Traducción Técnica y Científica: Ingeniería de Petróleos/ Evaluación del Uso de Catalizadores Liposolubles en Procesos de Inyección de Vapor para el Recobro Mejorado de Crudos Pesados y su Relación con la Integridad de Aceros al Carbono.[3]*

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Key Words: Traducción técnica y científica, extracción de petróleo, enfoques de traducción, proceso de pre-traducción.

Descripción: Para este proyecto de pasantía en traducción se tradujeron dos artículos de investigación, uno del inglés al español y otro del español al inglés, haciendo traducción directa e inversa, respectivamente; esto en cuanto a la direccionalidad de la traducción. El tipo de traducción implementada es Traducción Científica y Técnica en el campo de la industria de extracción de petróleo, con técnica híbrida de inyección de vapor en Colombia. Este proyecto de pasantía se realiza en apoyo a la Escuela de Ingeniería de Petróleos de la Universidad Industrial de Santander. Como soporte teórico se utilizaron diferentes enfoques de traducción tales como Skopostheorie, el enfoque Funcionalista (Nord, 1997), y técnicas de traducción (Hurtado, 2001). Para el proceso de pretraducción se incluyeron tres etapas: 1) el encargo de traducción o *translation brief*. 2) La construcción de un banco terminológico (glosario). 3) La lectura de textos paralelos en inglés y en español. Finalmente, durante el proceso de traducción, se encontraron diferentes desafíos lingüísticos tanto en los textos de origen como al realizar las traducciones. Tales desafíos se abordaron utilizando estrategias de afrontamiento que incluyeron el uso de concordancias y diccionarios en línea y especializados, así como el uso de corpus (textos paralelos) para comparación y referencia. Estos procesos de traducción como pasantía de investigación ayudan a fortalecer la capacidad investigativa y productiva de los grupos de investigación. Por medio de la traducción, los grupos pueden diseminar sus productos y colaborar en formación de redes conocimiento científico. Los productos de la traducción de los artículos científicos son generalmente publicados en revistas indexadas a nivel internacional. Asimismo, este proyecto de traducción servirá como guía para futuras investigaciones en el campo del recobro mejorado de petróleo en el contexto colombiano, así como para proyectos de pasantías similares en el campo de la traducción técnico-científica con un enfoque funcionalista.

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Introduction

Contextualization of the Colombian oil industry

The earliest history of oil findings in Colombia dates back to the Spanish conquest period as narrated by Fernández de Oviedo in his chronicles from 1541. In his documents, he makes reference to oil wells found and used by indigenous people in La Tora, known today as the city of Barrancabermeja in Santander. The oil was used with the assumption to give more muscle strength and to reduce fatigue, spreading it all over their bodies (Vasquez, 1994, p. 99).

During the early 1900s, Colombians José Joaquín Bohórquez and Roberto de Mares took interest in starting oil extraction and negotiations to trade. Bohórquez is believed to formerly have found the oldest oil well in the country. In 1905, de Mares obtained a license known as *Concesión de Mares* seeking to begin with the explorations and the exploitation of the well. (Vasquez, 1994, p. 100). With the support of President Rafael Reyes, de Mares traveled to the United States at the end of the first world war and established contact with the founders of the Tropical Oil Company (TROCO) "a subsidiary of Standard Oil of New Jersey" (Sáenz, 2002, p. 117), owned by John Rockefeller.

Consequently, de Mares succeeded in starting negotiations with the North American Tropical Oil Company and in 1919, the Colombian government authorized the transfer of the Concession (Concesión de Mares) to the latter (Vasquez, 1994, p. 101). In fact, during these early

stages of oil extraction, many jobs were created in our country and the attention of international investors was attracted.

Official oil extractions began in 1919 when TROCO started operations; however, the time frame that was registered in a resolution signed by the government was from 1931 to 1951, the year in which the reversion of the concession took place, known as *La reversión de Mares*. Towards the end of these early stages of oil extraction, the state-owned oil extraction company named Ecopetrol was founded as a result of this reversion by taking the assets reverted from TROCO. Ecopetrol later became the administrator of the new association of contracts designed in 1974 allowing for larger exploration areas (Echeverry et al., 2009, p. 3).

Currently, there are 23 sedimentary basins in Colombia and "only 7 of them are oil producers and two, natural gas producers" according to Agencia Natural de Hidrocarburos (2007), as cited in (Malagón, 2016, p. 13). The largest and most important sedimentary basin in the country is located in Los Llanos Orientales in which the highest amount of crude oil is produced (68,9%) in all the country (Malagón, 2016, p. 13), comprising about 337 oil fields. Among these, the three largest and major oil fields producers in Colombia are Rubiales, Castilla and Quifa. The second most important basin is the basin of Valle Medio Magdalena (VMM for its initials in Spanish), which comprises the regions of Antioquia, Cesar, Santander, Boyacá and Cundinamarca. In fact, the foremost oil fields in this basin are la Cira-Infantas and Yariguí-Cantagallo, which are located in Santander, as well as being the most important in the region.

When it comes to the extraction of crude oil in these areas, it is important to mention that there are different general factors regarding the state and composition of the crude, which influence its extraction and refining processes. Oil might be either found in a gaseous or liquid state. In its liquid state, it could range from light to extra heavy, which is determined by its API (American Petroleum Institute) degree. Density levels may vary depending on the API gravity, that is, the greater the API gravity, the lighter the oil and the fewer refining processes are required to obtain expensive products, such as gasoline (Ecopetrol S.A, 2014, p. 7). Currently in Colombia, from the twenty departments that extract petroleum, only Norte de Santander extracts light crude oil, five of them extract medium crude oil, and the remaining departments extract heavy crude oil.

Oil extraction methods have changed and advanced significantly throughout history. In fact, the first oil wells were drilled with a method called percussion or cable drilling, which is a manual technique that uses a hammering bit [U1] attached to a cable. In addition to this, vertical extraction, which was used until the 1970s, was replaced by directional drilling; a more modern non-vertical technique used to get access to deeper reserves, this technique also allows the drilling of reserves with horizontal sections. Furthermore, such advances have made it possible for deep directional drilling to be applied not only in the mainland but also in the sea (Ecopetrol S.A, 2014, pp. 22-23).

Finally, Colombia's constant changes in regards to policies for oil extraction have affected its relationship with international companies and investors. For example, the

aforementioned *Conseción de mares* and later on, the Association Contracts designed by 1984[5] Colombia's production of oil rose steadily, peaking in 1999. After this year, there was a brief plateauing period, but the country's production started to decline towards the year 2000 due to multiple causes. One of them was the lack of discoveries of oil fields as well as the natural decline of already existing wells. After this period and changes to the regulatory framework, which led to international companies investing in oil extraction, Colombia underwent a quick growth between 2008 and 2013. Nevertheless, it is very important to mention that the constant attacks to the pipelines caused by the armed conflict in Colombia have also affected investment and oil pricing (U.S. Energy Information Administration, 2019).

Characterization of the Research Group

The Enhanced Oil Recovery research group (abbreviated to GRM in Spanish) was created in September 2004, as a result of the agreement for technological cooperation 004 reached in 2004 between the School of Petroleum Engineering at Universidad Industrial de Santander and ECOPETROL S.A, through the Colombian Petroleum Institute (Instituto Colombiano de Petróleo, ICP, in Spanish). The agreement had an initial duration of four years. Due to the strong research bond between the parties, such agreements have been renewed and extended during the periods of 2008, 2013 and most recently in 2016 through another agreement known as ALIANZA.

[5] "which led to almost complete loss of competitiveness for contracts for investors" (Echeverry et all 2009: 4)

The General objectives of GRM include “create a research group with appropriate members such as reservoir engineering specialists, research engineers, research assistants, among others, aiming to develop research projects related to enhanced oil recovery and to consider comprehensive solutions to technical necessities in the national oil industry”. Some of the specific objectives of the research group GRM are as follows:

“- Develop cutting-edge technology for enhanced oil recovery processes including the design, implementation and optimization. This technology will be included in research projects for students to develop their ideas about the processes and techniques for enhanced oil recovery.

- Raise awareness on the importance of the aforementioned processes for the oil industry both nationally and internationally. (Minciencias, 2018).

GRM has nine main lines of research: air injection, steam injection, water injection, blast-enhanced water injection, surfactant injection, computed tomography, integrated reservoir management, miscible injection, and polymer injection. These research lines are focused on secondary and tertiary recovery methods comprising chemical and thermal recovery.

Furthermore, the research group has been recognized with category A by Colciencias and has won the ECP award for innovation. The following is a compilation of the group’s intellectual production: 143 bachelor theses, 44 masters’ theses, 75 events memoires, more than 60 article

publications, 65 talks, more than 26 software tools, and 1 patent for radial displacement equipment (EDR)[6].

Active members of this research group are its director MSc. Samuel Fernando Muñoz Navarro, who is also a professor of the School of Petroleum Engineering; Professors Maika Karen Gambus, Ph.D., Viatcheslav Kafarov, Ph.D., Ronald Alfonso Mercado Ojeda, Ph.D., and Adan Yovani León Bermúdez, Ph.D, who is also the co-director of this internship project. In addition, the research group has been supported by professionals in the oil industry from Ecopetrol and students from Capital Semilla Research Program.

Presentation of the internship research project

Our research internship project is named *Bidirectional translation of research papers related to enhanced methods for oil extraction.* Our first article commission is a translation from English to Spanish with the name of *Optimization of the preparation conditions for cocoa shell‐based activated carbon and its evaluation as salts adsorbent material*. For the second article, we conducted a translation from Spanish to English and its name is *Determinación de las propiedades fisicoquímicas en fracciones pesadas del petróleo.*

These translations are supported by Semillero SETRA from the School of Languages at Universidad Industrial de Santander, within the interdisciplinary project of translation with the School of Petroleum Engineering and their GRM research group. The project is directed by Professor Heidy Alegría Gutiérrez León and co-directed by Professor Adan Yovani León

[6] EDR: Equipo de laboratorio de Desplazamiento Radial: *Radial Displacement Equipment.*

Bermúdez. Along these lines, the main purpose of this internship project is to foster, strengthen and maintain collaboration among different fields of knowledge. In order to achieve this, the interns are expected to carry out translations of academic articles, research studies, slides, abstracts, and other scientific texts with the purpose of being published or contributing to the dissemination and appropriation of knowledge.

Justification

This project can serve as a guide for further investigations on the field of oil recovery in the Colombian context, as well as for similar internship projects in the field of technical-scientific translation with functionalist approaches. Furthermore, with these collaborative translations, we attempt to show that technical-scientific translation may contribute in terms of the social, educational, and economic development of the country. Therefore, this project may help give visibility to the university, its research groups involved in interdisciplinary projects, their members, and above all, translation academics and their work. In fact, according to (Pinchuck 1977:13) “Scientific and technical translation is part of the process of disseminating information on an international scale, which is indispensable for the functioning of our modern society.”

From the execution of this project, the investigative capacity may be strengthened with the generation and dissemination of new scientific knowledge through the publication of articles in indexed, peer-reviewed journals. To fulfill this purpose, the articles assigned managed to complete the process of briefing; terminology extraction; documentation; translation from

English to Spanish; translation from Spanish to English; and proofreading and edition, within the framework of the project.

1. Internship objectives

1.1 General Objective

a) Apply the theoretical and procedural knowledge necessary for the translation of scientific and technical texts related to enhanced recovery methods in laboratories at UIS.

1.2 Specific objectives

a) Contextualize the translation work within the field of the oil industry in Colombia.

b) Acquire knowledge about the conceptual and terminological structuring of the field and the subject matters of the texts to be translated.

c) Make use of strategies and tools necessary for the comprehension of scientific, technical and technological texts.

d) Systematize the work phases of scientific and technical translation.

e) Solve translation problems posed by source texts based on the selection of translation approaches, and tools available to translators.

f) Produce translations of assignments with professional quality (clarity, accuracy, fluency, and adequacy).

2. Theoretical Framework

2.1 Background and related research

Scholarly work and research in Translation Studies have focused mainly on literary translation, rather than scientific and technical translation (STT) (Olohan, 2007, p. 131). This author investigates the current position of this subfield of translation and in this section we put forward some of her findings.

Most of the studies and written material found about technical and scientific translation intend to define the concepts and explain their characteristics (Wright, 1993; Olohan, 2015; Pinchuck, 1977). In a study carried out by Franco (2004, p. 40), the author deals with the historical development of both technical and scientific translation, quantitatively and qualitatively showing that as such, “concern for technical and scientific translation only appears in the 1950s” for before, too much attention was paid and effort put on religious and literary translation.

Similarly, Campbell (2005), (as cited in Olohan, p. 132), examined 70 articles from major translation journals and found that the highest percentage was literary translation work as opposed to non-literary. Likewise, Franco (2004, p. 32), as cited in Olohan (2007, p. 132),

"reports on a survey of entries in the online Bibliography of Interpreting and Translation where he finds that, out of a total of 20,495 entries, only 1,905 are categorized as ‘technical’.

Technical translation is often regarded as “easier”, “restricted”, “machine-like”, among others (Postolea, 2016, p. 53), however, translating scientific and technical texts is demanding as well and it has its unique challenges (Postolea, 2016, p. 51). The reason why technical translation is thought to be easier is because of its terminology which can be “standardized” and so it could be seen as a rather “automatic task” (Postolea, 2016:56). Thus, although scientific and technical translation is not always preferred, it is highly demanded nowadays and very important for the labor market.

Other findings reveal that when it comes to scientific and technical translation, the major fields in TT and ST[7] are legal translation, medical translation, business, and IT translation respectively. As for the characterization of translators and interpreters in Colombia, an important quantitative study was carried out, showing that most professionals in the area of translation work with technical and scientific translation (Clavijo et al., 2020, p. 695), informing us about the relevance of these fields in translation for the labor market in the country.

It is also important to mention that scientific texts have been studied by Translation Studies scholars "from the perspective of terminology or phraseology (e.g. Pearson 1998, Bowker and Pearson 2002)" Olohan (2009 page). In fact, professor Bowker in Ottawa has

[7] TT referring to the term “target text” and ST to the term “source text”

focused her research on the use of corpora and computer-aided translation, also including technical translation, phraseology, and term extraction (Quirion, 2003, p. 299).

2.2 Theoretical bases

2.2.1 The Text Typology in Scientific and Technical Translation

According to Byrne (2006), translation is important nowadays, in the information age, since it has copiously nourished technical and scientific advancement, although translation has not been limited to these areas. In fact, we can take evidence of this by how the world has evolved, inventions, and in general, technological advances that lead to daily life changes. Scientific and technical translation (STT) is considered an important area through which to disseminate knowledge in these fields, e.g. healthcare, software and manufacturing sectors, which happen to be the fields that spend the most on translation (Byrne, 2006, p. 15).

In fact, scientific and technical translation is nowadays considered the most profitable labor source in the field of translation for translation students (Byrne, 2006, p. 14). Similarly, Olohan (2016, p. 8) states that "a large proportion of professional translation work is technical or scientific". In other words, although the market demand for the translation of certain texts depends on the different combinations of languages, technical and scientific translation is one of the most requested in the professional markets when compared to other types of specialized texts (Bruno, Luque, Ferreyra 2016, p. 6).

In addition to this, Wright & Wright (1993:1) assert that in order to translate accordingly and to produce technical (and scientific) texts, it is essential to have a great mastery of the source and target languages and also have an expert-like understanding of the subjects addressed. Likewise, in accordance with Zheng (2017, p. 32), “a translator must not only have a good command of language and translation competence, but know about science and technology”.

Also, when translating technical and scientific texts one must consider specific features from these types of texts. Above all, Newmark (1981) as cited by Zheng (2017, p. 32), states that these types of text are considered to be informative and expected to be accurate, practical, objective, brief and concrete, just as the product (translation) or the target text should be.

2.2.2 Difference between Technical and Scientific translation

Technical and scientific translation is seen and usually used as a single term, somewhat unified, although they are claimed to be different and are not supposed to be used interchangeably. Pinchuck, as cited in Byrne (2006, p. 2), mentions that there is a great deal of overlap between the two categories: technical and scientific translation, that is to say, they are closely related to one another, since "theoretical scientific information, is likely to become tomorrow's technology and provides as a result, various tangible products, devices, services and so on".

Another similar approach to address the differences between both categories is the translation purpose of either text type. Technical texts are usually designed to provide information clearly and effectively, while scientific texts discuss, synthesize and analyze

information by explaining ideas, presenting theories and testing methods, as suggested by Byrne (2006, p. 8). Based on the overlap between these two types of texts, and the shared characteristics and purposes of the texts that will be used in our project, we will classify them regarding the nature of the information presented. For this specific translation project, both are scientific texts, because they present theories, explain experimental procedures and discuss findings. Along these lines, we aimed to translate for a target public, expert in the same field of research (Petroleum Engineering), but at the same time with accuracy and respecting the style and structure of the source text. In the following subsections, we present the theoretical underpinnings that helped us conduct the translation strategy for this project.

2.2.3 Skopostheorie and Scientific and Technical Translation

Skopostheorie comes from the word Skopos which means "purpose" or "aim" in Greek (Du, 2012, p. 2190). This theory was developed by Veermer in the 1970s in Germany and sees translation "as an action with purpose" and it is considered to be the starting point for the development of the functionalist translation theory. This theory was informed by Action Theory[8], and as such, each action should have a purpose (Skopos) (Du, 2012, p. 2190). Skopostheorie is an orientation focused on the target text rather than on the source text and considers two major concepts: coherence and culture. On the one hand, coherence is divided into intratextual and intertextual coherence. The former refers to the fact that the translation must be coherent enough to be understood by the target readership in agreement with their expectations and cultural

[8] Action theory is based on the fact that every action should have a purpose. Translation, being an action by itself, should then have a purpose too. (Du, 2012, p. 2190)

context. Intertextual coherence deals with the relationship between the target text and the source text, and that the TT must be as faithful or say equivalent, to the ST. On the other hand, culture plays a key role in this theory as well as in functionalism, since translational interactions are often multicultural and take place in a certain space and time (Nord, 1997, p. 44). In that sense, the translation should conform pragmatically to the addressees' expectations, cultural variations, and conventions.

2.2.4 Functionalism in Technical and Scientific Translation

Other authors have adopted a different approach to technical translation as opposed to that concerning equivalence and approaches too attached to the conventionalities and attributes given to the source text. For instance, Reiss (1971) and House (1981) started to focus their attention on the function of the text in the target language, readership and culture or "the function of the target text" (as cited in Byrne, 2006, p. 31). In this case, in functionalism, the focus is on both the source text and the target text and takes into account "pragmatic and situational aspects of the translation process" (Byrne, 2006, p. 31). Nevertheless, the focus is, again, rather on the TT. This approach is thus more purposeful and acknowledges the reason or intentionality behind the translation work. This translation intention or purpose, or its function is, as Nord (1991, p. 41) points out, the main reason that should motivate the translator's decisions during the translation process, as a way to fulfill the intended purpose with the TT in particular target-culture situations. Additionally, Nord (1991) also states that the translation function itself should be defined "by the purpose of the intercultural communication", that is, taking into

account both, ST and TT cultural matters, conventions and mainly the intended communicative function (Nord 1997, p. 42). This approach was of significant importance while planning and conducting our internship project as it allowed us to take into consideration the objectives of the source text alongside the target text which was to be published in international journals. This guided us through the vocabulary that was to be used on the target text as well as the formality of the language and the specific register for academic purposes.

Functionalist approaches to translation came to change the paradigm in Translation Studies and to be developed during the second half of the 20th century (UKessays, 2018). Likewise “functionalist approaches generally believe that the function of a text in the target culture determines the method of translation” (UKessays, 2018). Framed within the Skopostheorie we find different approaches to translation such as Functionalism, the theory of translational action that will be further explained within the following section.

2.2.5 Technical and Scientific Translation and Translation functions

Taking as a point of reference the models of language functions proposed by Bühler (1934) and Jakobson (1960), Nord (1997, p. 48) puts forward four basic translation or communicative functions: referential function, expressive function, appellative function, and phatic function. In this translation project, we will be dealing with mainly the referential and the appellative functions. The referential function refers to "the objects and phenomena of the world and its main sub-functions are informative, metalinguistic, metatextual, and directive. The appellative function is directed or referred to "the receiver’s sensitivity, previous experience or

disposition to act, and some of its main sub-functions are illustrative, persuasive, imperative, pedagogical, advertising, etc." (Nord, 1997, p. 48). In short, we will be using these functions because the nature of the source text is scientific, which means that the texts are informing and/or transmitting information about objects and phenomena under experimentation and their results. Likewise, through translations, we may facilitate possibilities to illustrate processes, debate results, and learn procedures from academic peers.

Nord (1997, p. 49) identified two types of translation: documentary translation and instrumental translation. The former is the translation of texts marked as somewhat explicitly translated from the source text culture, and the latter, are the translations seen as "directed at a target-culture", of object-text type. Instrumental translations may intend to attain the same purpose or function as the ST (equifunctional translation) or a different one (heterofunctional translation) (Nord, 1997, p. 49). In that sense, our goal will be to produce equifunctional translations, since the functions intended in the source text will be the same in the target text.

In the same vein, this project adopts another aspect key to Functionalism: the translation brief, which “refers to the definition of the intended purpose of the translation process” (Nord, 1997, p. 47) and includes the intended communicative function of the TT (Nord, 1997, p. 48). According to Nord, the translation brief should take into account key information for the translation project, such as the TT addressees, time and place of the text reception, medium, and motive. This translation project took those aspects into account since, as suggested by the author, they are essential for the translator’s decisions. And it was indeed very useful when we needed to

consider aspects such as what to include, exclude, or modify in the two translation assignments of this project following the client's requests, target culture, and readership's expectations.

3. Methodology

3.1 Role of the translation

This translation project will contribute to the research group GRM and its research project with high-quality translations of two articles or research papers, which means that translations will be clear, fluent, accurate, and adequate. Furthermore, we will play an important role in the dissemination of knowledge by rendering these pieces of knowledge in the field of Petroleum Engineering, so as to make them available to an international audience in the English language across different countries and cultures.

Together with Skopostheory and Functionalism as the theoretical foundations for the translation project, Hurtado-Albir's techniques (2001, p. 269) also represented major theoretical support to the translation process. The section below puts forward some of the notions regarding translation techniques presented by the author.

3.1.2 Translation Techniques by Amparo Hurtado

After the 1950's a number of classifications for translation techniques have appeared in the effort to set theoretical and pragmatic approaches for the systematic practice of translation. As Amparo Hurtado Albir (2001, p. 257) mentions, Vinay and Darbelnet (1958) are the first ones

to define and classify translation techniques. These techniques are classified between literal and oblique. Literal translation for the latter, allows a more direct translation process with languages from similar cultures, while oblique translation does not allow word-by-word translation.

In Vinay and Darbelnet's classification, we can find 7 essential procedures: borrowing, which involves the use of a word of the ST without being translated. Transposition, which involves changes in grammatical structure without altering the meaning. Modulation, which involves a change of form introduced by a semantic modification. Equivalence, which implies the use of a different expression to attain a better level of equivalence. Calque, which implies the use or creation of a neologism using the structure of the source language. Literal translation, which uses word-for-word translation (Only possible between languages of similar cultures) and adaptation, in which a cultural element is used as a substitute in the ST (Hurtado Albir, 2001, p. 258).

Based on this classification of translation techniques many different approaches to the concept of translation techniques sprouted through the years. For instance, as mentioned by Hurtado Albir (2001, p. 261) we find authors like Nida, Taber and Margot, who in their case, did not propose a specific taxonomy with categories but rather a set of considerations, which grouped some of the notions and procedures of Vinay and Darbelnet, for cases in which there is no clear equivalence on the TT.

Furthermore, we find Vázquiez Ayora's (1977) approach to Vinay and Darbelnet's proposal which he further expands with the addition of new procedures called: Omission,

displacement, and inversion. Additionally, Vazques also makes one special remark in regards to translation strategies, stating that every one of them is oblique and that these strategies can be divided between main procedures and complementary procedures (Hurtado Albir, 2001, p. 262).

Before her own classification of translation techniques, Hurtado Albir presents two more authors that contributed to the formation of that notion. First, Jean Delisle (1993) made some nuances to the classification made many years before by Vinay and Darbelnet and reduced the concepts of extension/condensation and amplification/economy to a unique concept of reinforcement/economy. And lastly, Peter Newmark (1988) decided to group both Vinay and Darbelnet and Nida's, Taber's and Margot's proposals and add new procedures: recognized translation, functional equivalent, naturalization, and translation tag. Additionally, Newmark also proposed the idea of grouping two or more translation techniques referring to them as doublets, triplets and quadruplets (Hurtado Albir, 2001, p. 264).

Finally, Hurtado Albir's classification also intends to illustrate the differences between the notions of technique, strategy, method, and error of translation. She also intends to observe processes regarding text translation and not language comparison. Based on the previous notions and processes, the author determines that the notion of *technique* would be the most appropriate in terms of its functionality during translation analysis and practice (Hurtado Albir, 2001, p. 268).

As for the present project, we will be making use of some of the main translation techniques proposed by Amparo Hurtado due to its compatible structure with our project and its

purposes. Some of the techniques of this classification are: Adaptation, used to replace a cultural element for another one of the target culture. Linguistic extension, is used to add linguistic elements. Amplification is used for the addition of details that are not formulated in the original text. And lastly, compensation, which is used to introduce an element in a different place as it would have been in the ST.

3.2 Resources

The resources that were used to complete the translation process during our internship consisted of multiple online dictionaries such as the Cambridge dictionary, as well as more specialized dictionaries on the web, and also including the Dictionary of Oil, Gas and Petrochemical Processing (2014), the Oxford Dictionary of Chemical Engineering (2014), and glossaries of Oil and Gas terms and the Petroleum Industry in English and Spanish. Additionally, we also used different available websites and concordances to complement the terminological extraction for the texts and the use of adequate synonyms.

3.3 Development of the internship project

The preparation for our internship project started by taking the prerequisite course of Text Translation offered by the School of Languages and taught by the director of the group of translation SETRA Heidy Alegría Gutiérrez León. During this course, the basics for translation, briefing and translation approaches were covered. Right after the course and before starting with this translation project, we received specialized training regarding the specific translation

approach that was expected to be used during the translation of the technical and scientific texts. The courses of translation I (28595) and translation II (28596) were taken by the interns at UIS to acquire the required knowledge to take on the translation assignments including the most relevant translation techniques for technical and scientific translation, and plenty of hands-on activities. However, having passed Translation I was the official requirement to begin the internship project.

3.4 Pre-translation process

Before starting the translation per se, several tasks were carried out to prepare the ground for the completion of each translation assignment. Those included, as mentioned before, training in translation, carrying out a translation brief, as well as the creation and development of terminological extraction, which involved the creation and management of a terminology bank.

The terminology bank was initially created using a matrix that was adapted to a glossary later (See Appendix A). This glossary was created by Henry Roman and Camilo Salazar in 2021 for their internship translation project that preceded ours and was also directed by professor Heidy Alegria Gutierrez. It was enriched by us with the addition of words and terms found in the new translation assignments as well as their definition from a reliable source, and the translation in English or Spanish.

The translation brief was essential for the fulfillment of the translations in this project, since it informed us about important details such as the addressees -or target readers-, the place and time of reception, the medium, and most importantly, the communicative functions or

intended purpose of the target text, which in this case was more referential (to inform) or objective (Nord, 1997, p. 48).

During the translation process, matrixes for parallel texts and linguistic challenges with coping strategies were also created and continuously enriched. Such challenges are to be addressed in detail in the following section.

As stated above, parallel texts and linguistic challenges matrixes were created during the translation process. The term “parallel texts" is used as a synonym of “corpora” or even “parallel text corpora” or “translation corpora” (Linköpings universitet, 1999, p. 232). In fact, some studies have focused on exploring the use of corpora for the translation of technical texts to obtain better translations (Linköpings universitet, 1999, p. 232), and even to promote creativity (Rodríguez, 2016, p. 88), as opposed to using translation memories. These corpora were stored in a table that included the title, the author(s), the type of text, the place where it was published and the type of publisher (See Appendix B).

By and large, we identified that there were more linguistic and translation challenges with the second source text in Spanish than with the first source text in English. The most distinctive feature between both texts was that punctuation marks were better placed too in the latter. Thus, no major shortcomings were encountered in this article, maybe because this paper had already been published and undergone editorial processes. Another relevant aspect to underscore is that the source text in English also contained a richer and more varied use of linking devices. On the contrary, the Spanish source text -for the second translation- presented lack and misuse of linking

devices. Table 1 below shows some examples of the use and lack of linking devices in the source texts for this translation project: the lack of linking devices will be represented by the symbol (X) where it could have been placed.

Table I

Evidence of the use and misuse of linking devices found on the source texts

Source Text I	**Source Text II**
-Furthermore, it has been established, through thermogravimetry and heat treatment tests, that a high percentage of the lignocellulosic material is transformed into activated carbon, while organic compounds such as cellulose and hemicellulose are converted into liquid products and gasses. **Previously**, kinetic models from various heating rates with values around 5, 10, 15, 20, and 40 °C/min are determined. **However**, the heating rates depend on the type of biomass. From the curve with a specific heating rate, it is essential to identify the degradation stages of the substances studied. **In this way**, it is possible to determine the abrupt changes and the temperature range of mass loss. **Moreover**, a low heating rate around 10 to 15 °C/min is recommended, because there is a significant exothermic difference between pyrolysis and in situ heterogeneous oxidation of biomass (Melgar et al.(...)	-Para mejorar el rendimiento de extracción de fracciones y poder realizar una amplia caracterización, varios autores han venido desarrollando metodologías de separación aplicando la técnica de extracción fluida supercrítica con fraccionamiento, aprovechando la selectividad de los solventes bajo diferentes condiciones de operación. **(X)** La selectividad de los fluidos supercríticos facilita la obtención de una variedad de fracciones con cantidades significativas y permite ampliar los estudios de caracterización de una carga de forma más detallada (*Keng et al., 1997; Chunming et al., 2005*). **(X)** Conocer las propiedades fisicoquímicas de un fondo de vacío, ofrece una amplia ventaja en la clasificación, valoración y planificación de su refinación.

3.5 Linguistic challenges found in the source text and strategies we used to cope

During the pre-translation and translation process, we progressively identified some challenges that posed some level of difficulty to the development of our internship

objective. The challenges found in the source texts consisted mostly of grammatical mistakes, terminological inconsistencies, and lack or misuse of linking devices.

3.5.1 Punctuation mistakes

Most of the punctuation mistakes that we found came from the second source text, and in these mistakes , the most remarkable was the use of commas. In the next extract we show two examples that illustrate one comma-related mistake found in the second source text:

> *-La destilación simulada por cromatografía gaseosa de acuerdo a la norma ASTM-D 3710 y 2887**(,)** es aplicable para obtener altos porcentajes en peso de fracciones con puntos de ebullición hasta 260 y 538 ºC, respectivamente (Page 2).*
>
> *-La técnica de extracción con hexano en condiciones supercríticas**(,)** ha sido implementada en esta investigación con dos finalidades (Page 1).*

After a revision of the uses of the comma in the Spanish language, we evidenced that the use of the comma between the subject and the verb is not a recognized use for it as it interferes with the cohesiveness and cohesion of the text (RAE, 2010, p. 313).

Another comma related issue found in the same text is the absence of commas when introducing clauses, as in the following example:

*-Por tanto, para mejorar esta necesidad**(X)** se desarrolló la correlación considerando las propiedades físicas que mostraron mayor consistencia con los datos experimentales. (Page 8).*

One of the main purposes of the comma in Spanish is that of isolating supplementary elements that provide clarifications, additions, rectifications or additional information to what has been said (RAE, 2010, p. 307).

3.5.2. Terminological inconsistency

One example of terminological inconsistency that we could identify in the second source text was the word "fracción" to which in many cases the words "carga" or "corte" were used interchangeably making it a challenge at the moment of the comprehension and translation processes, due to their negative influence in the coherence and cohesiveness of the text. In the following examples, we show evidence of this terminological inconsistency in the text.

*-Por un lado, extraer cantidades significativas de **fracciones** a partir de fondos de vacío provenientes de mezclas de crudos colombianos (Page 2).*

*-Estos resultados indican que el peso molecular incrementa en cada **corte** consecutivo con el aumento de la presión (Page 7).*

*-Teniendo en cuenta que la tendencia del rendimiento de coque formado es proporcional al contenido de CCR de la **carga** procesada (Page 7).*

3.5.3 Lack or misuse of linking devices

Conjunctive adverbs or transitional expressions “help your writing flow smoothly. One type of transitional expression, the conjunctive adverb, also serves to connect independent clauses that are coordinate” (Writer´s Source Lab, 2010, p. 1). Also, “Conjunctive adverbs are usually placed between two independent clauses following a semicolon and followed by a comma” and, “when conjunctive adverbs occur anywhere else in the sentence, they are usually separated from the rest of the sentence by commas” (Writer´s Source Lab, 2010, p. 1). There was notably a lack of linking devices in the second source text, as it was stated previously. Such drawbacks were dealt with by adding the appropriate linking device in the target text (the rendition or translation of the article). See Table II below for its illustration. The symbol (X) will be used again in the space where the linking device should have been placed.

Table II

Coping strategies for the lack or misuse of linking devices

Source text sample (Spanish)	**Target text translation (A word-to-word version)**	**Coping strategies (Actual translation)**
A). Los fondos de vacío y sus fracciones obtenidas mediante extracción con n-hexano en condiciones supercríticas fueron caracterizados con los métodos ASTM como: densidad D-4052/70, Carbono Conradson D-4530, metales (níquel y vanadio) B-5863, viscosidad D-445, destilación simulada D-7169, azufre D 4294 y el análisis composicional SARA D-2007.	A). The vacuum residues and the fractions obtained by extraction using n-hexane under supercritical conditions were characterized with ASTM methods such as density D-4052/70, Carbon Conradson D-4530, metals (nickel and vanadium) B-5863, viscosity D-445, simulated distillation D-7169, sulfur D-4294, and compositional analysis SARA D-2007. **(X)** molecular weight	A.) The vacuum residues and the fractions obtained by extraction using n-hexane under supercritical conditions were characterized with ASTM methods such as density D-4052/70, Carbon Conradson D-4530, metals (nickel and vanadium) B-5863, viscosity D-445, simulated distillation D-7169, sulfur D-4294, and compositional analysis SARA D-2007. **Similarly,** molecular

(X) El peso molecular se determinó por osmometría de presión de vapor (VPO).	was determined by osmometry of steam pressure (VPO)	weight was determined by osmometry of steam pressure (VPO).
B). El rendimiento de extracción se ve favorecido hasta un valor máximo con el incremento de la presión, luego la cantidad extraída es mínima debido a la disminución del contenido del fondo de vacío dentro de columna de extracción. Los resultados reportados permiten evidenciar que se obtienen mayores rendimientos de extracción en el rango de operación entre 850 y 1050 psi. **(X)** La tendencia de los resultados se puede atribuir al efecto de la solubilidad en el fluido supercrítico, que incrementa con el aumento de la densidad (Sapkale et al., 2010).	B). The extraction yield is favored up to a maximum value with increasing pressure, then the amount extracted is minimal due to the decrease of the vacuum residue content inside the extraction column. The reported results show that higher extraction yields are obtained in the operating range between 850 and 1050 psi. **(X)** The tendency of the results can be attributed to the effect of solubility in the supercritical fluid, which increases with increasing density *(Sapkale et al., 2010).*	B). The extraction yield is favored up to a maximum value with increasing pressure, then the amount extracted is minimal due to the decrease of the vacuum residue content inside the extraction column. The reported results show that higher extraction yields are obtained in the operating range between 850 and 1050 psi. **Furthermore,** the tendency of the results can be attributed to the effect of solubility in the supercritical fluid, which increases with increasing density *(Sapkale et al., 2010).*
C). Comparando los rendimientos acumulados en las pruebas de fraccionamiento para los fondos de vacío A, B y C, se puede decir que los rendimientos de extracción del fondo de vacío A son mayores debido al mayor contenido de las fracciones de saturados, aromáticos y resinas. **(X)** Los resultados muestran que el rendimiento de extracción está limitado por la naturaleza de los compuestos y su porcentaje composicional.	C). Comparing the cumulative yields in the extraction (fractionation) tests for the vacuum residues A, B and C, it can be stated that the extraction yields of the vacuum residue A are higher due to the higher content of the saturated, aromatic and resin fractions. **(X)** the results show that the extraction yield is limited by the nature of the compounds and their compositional percentage.	C). Comparing the cumulative yields in the extraction (fractionation) tests for the vacuum residues A, B and C, it can be stated that the extraction yields of the vacuum residue A are higher due to the higher content of the saturated, aromatic and resin fractions. **Additionally**, the results show that the extraction yield is limited by the nature of the compounds and their compositional percentage.

In the examples above (A, B and C), we used the translation technique of linguistic extension (Hurtado Albir, 2001, p. 269) which consisted of the addition of an extra linguistic element to help convey meaning and enhance comprehension and the writing style of the target text.

3.6 Linguistic challenges for the translation of the target text and coping strategies

As for the actual translation process, we encountered some linguistic challenges influenced both by the source text due to syntactic and lexical implications, and by the complexity that technical and scientific translations entail. When it comes to the translation of specialized texts, one common challenge is that not all of the technical terms of the subject matter at stake are included in databases, "finding the right word combinations and register", as well as "keeping up with genre conventions and communicative functions" (Postolea, 2016, p. 59, 60). In fact, this is one of the reasons why translators need to create their own data banks for specialized projects, just as we did.

Furthermore, another important challenge for this project was the terminology inconsistency, which hindered the smoothness of the translations as we have mentioned earlier. About this, some authors state that the translator must have an excellent mastery of both the source and target language and also a great deal of knowledge and understanding of the subject, the type of text that they are dealing with, and the terminology (Byrne, 2006, p. 1), which is also demanding to some extent. In order to cope with the challenge of comprehension, we created and went over a number of parallel texts about enhanced methods for oil extraction in Colombia and

elsewhere in order to get acquainted with the procedures and chemical elements used. Also, it was useful to have conversations with the clients and our colleagues in translation who have already worked with this type of texts and similar contents.

Finally, the revision process, supported by professors Gutiérrez and León helped us identify some translation issues that we later corrected, using the different dictionaries and resources mentioned earlier. Another very helpful online tool that was highly used were concordances websites that allowed us to check different versions of translations in different real contexts. The most common linguistic challenges during the translation of the target text are put forward in the following sections.

3.6.1 Terminology and false cognates

The terminological inconsistency identified in the source texts caused the same phenomena in the translation work for the aforementioned reasons, although terminology inconsistency was less frequent in the target texts. An example of this is the translation of the terms mentioned in the previous terminology inconsistency section: "*corte*" "*carga*" y "*fracciones*" which in the first draft of the target text were translated as: "cut" or "cut-points", "cargo" and "fractions" respectively. Such errors were highlighted and then corrected uniformly to achieve a higher consistency in the text by only using the term "*fracciones"*.

Last but not least, false cognates also caused confusion in the comprehension and translation of the second source text. The most common translation or direct translation for the word "*desarrollar***"** in Spanish is "to develop" in English. However, in the following example:

"se desarrolló una correlación…" from the source text, which was initially translated as "a correlation was developed…" it was noted that the use of the verb "to develop" in English was not adequate in this very context. After revising and consulting a couple of online dictionaries such as the Longman and Oxford dictionaries, it was found that the appropriate verb that is used in the mathematics field context is not "to develop[9]", since it is not the appropriate collocation in this case but "to determine[10]". Thus, the final translation of this excerpt was: "a correlation was determined" after being corrected.

Conclusion and project evaluation

For this translation internship project, the following articles were translated. The first one from English to Spanish: Optimization of the preparation conditions for cocoa shell‑based activated carbon and its evaluation as salts adsorbent material and the second one from Spanish to English: *Determinación de las Propiedades Fisicoquímicas en Fracciones Pesadas del Petróleo.*

Based on the outcome of this translation project, more interdisciplinary projects based on Technical and Scientific translation will probably arise. This type of project aids in the dissemination of scientific knowledge, which is one of the main objectives of the Ministry of

[9] To develop: 1: to grow or change into something bigger, stronger, or more advanced, or to make someone or something do this. 2: to design or make a new idea, product, system, etc over a period of time… Procter, P. (1978). *Longman dictionary of contemporary English*. https://www.ldoceonline.com/dictionary/develop

[10] To determine (Mathematics): Specify the value, position, or form of (a mathematical or geometrical object) uniquely. (2021). Oxford University Press. Available at: https://www.lexico.com/definition/determine.

Education. This dissemination of scientific knowledge in the area of oil recovery is achieved not only at a national but also at an international scale given the scope of the translations done with a functionalist approach.

Pre, during and post-translation processes were carried out by means of applying the required theoretical and procedural knowledge for translation assignments, always bearing in mind the translation functions and intentionality of the briefings and source texts which guided the whole project. Lastly, it is important to mention that the initial objectives were successfully achieved by creating and following a well-organized plan that included the acquisition of the required knowledge, terminology extraction, as well as the implementation of techniques, strategies and tools that led to obtaining a quality project.

The article that represented the greatest difficulty in translating it was the second (translated from Spanish to English) due to grammatical drawbacks and specialized terminology. The difficulties that arose were in terms of terminology (including its inconsistency) and also in its comprehension due to the aforementioned. Some translation techniques and approaches were implemented in order to ease the work and translate in an efficient and organized way.

It is considered of vital importance to make known the following points as a recommendation for future authors in the matter: carry out a pre-translation process taking the translation brief as a starting point, pre-reading to determine possible writing errors and terminological inconsistency, terminological extraction, corpora search, translation and

subsequently, subject the texts to the required revision and editing, keeping in mind what the linguistic functions of the translation are.

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Appendices

Appendix A

Glossary fragment

A

- ***Absorbancia, absorbance*** **(n.):** a measure of the capacity of a substance to absorb light of a specified wavelength. It is equal to the logarithm of the reciprocal of the transmittance.
- **Aceite lubricante (n.):** *Lube oil*
- **Acuatermólisis, *aquathermolysis* (n.):** During the steam stimulation process, a series of reactions, called aquathermolysis, occur among oil, water and reservoir matrix. Catalyzing these reactions can provide significant upgrading of the oil at the temperature range of steam stimulation.
- ***Acuatermólisis catalítica (n.):*** *Catalytic aquathermolysis.*
- **Agitador mecánico, mechanical stirrer (n.):** a piece of laboratory equipment used to mix, blend, or agitate substances in a tube or flask by shaking them.
- **Agua desionizada, deionised water (n.):** Water without the presence of ions, except the hydrogen ion (H +). (Wegman, R. F., & Van Twisk, J, 2012).
- **Alícuota, aliquot (n.):** an amount taken from a larger quantity, so that it can be tested, etc. (Cambridgedictionary,com [www])
-
- **Alquitrán (n.):** *Coal tar*
- **Análisis de Varianza, analysis of variance (ANOVA)(n.):** a collection of statistical models and their associated estimation procedures (such as the "variation" among and between groups) used to analyze the differences among group means in a sample.
- **Arena Fluidizada, fluidized sand (n.):** When a constant flow of air is placed underneath any fine powder or granulated material. The air forces its way to the surface of the material reducing the friction of the sand and making it appear & behave like a liquid.
- **Aromaticidad, aromaticity (n.):** Property of an organic compound of being aromatic.
- **Asfaltenos, asphaltenes (n.)*:*** A class of compounds in crude oil that are black in color and not soluble in n-heptane. (Ramirez-Corredores, 2017)
- **ATR, ATR (Attenuated Total Reflection)(n.):** a sampling technique used in IR, which occurs when infrared radiation enters a high-refractive and transmitting ATR crystal.

B

- **Baja movilidad (n.):** *Unfavorable mobility*
- **Balance De Masa, mass balance (n.):** the analysis of a process in which the total mass of the chemical reactants is correlated with the total mass of the products according to the * law of conservation of mass.

C

- **Cadenas alquílicas, alkyl chains (n.):** In organic chemistry, an alkyl substituent is an alkane missing one hydrogen. ... An acyclic alkyl has the general formula of C_nH_{2n+1}. A cycloalkyl is derived from a cycloalkane by removal of a hydrogen atom from a ring and has the general formula C_nH_{2n-1}. Typically an alkyl is a part of a larger molecule.
- **Catalizadores, catalysts (n.):** a substance that enables a chemical reaction to proceed at a usually faster rate or under different conditions (as at a lower temperature) than otherwise possible. (Merriam-Webster)
- **Combustión in situ, in situ combustion (ISC)(n.).:** Burning a small part of the hydrocarbon to provide heat to reduce the viscosity or thermally crack the heavier ends. (Dictionary of Oil, Gas, and Petrochemical Processing)
- **Concentración, concentration (n.):** A quantitative measure of the relative amount of a component in a mixture. Concentration is often expressed as a mass and mole fraction.
- **Condensación aromática (n.):** *Aromatic condensation.*
- **Condiciones batch, batch conditions (n.):** A measured amount of crude oil or refined products in a pipeline or storage tank.
- **Condiciones de yacimiento (n.):** *Reservoir conditions*
- **Crudo, crude (n.):** oil from rocks underground in a natural state that has not yet been treated. (Cambridge Dictionary)
- **Crudos Pesados, heavy crude oils (comp. n.):** Crude oil of 20° API gravity or less; often very thick and viscous.

Appendix B

Matrix of parallel texts

Title	Author(s)	Type of text	Published in	Type of publisher
Estudio del proceso de obtención de carbón activado a partir de la cáscara de cacao criollo (Theobroma cacao), UNAN-Managua, Agosto-Diciembre 2020	González Martínez, Grethel Alexandra and Villalobo Peña, Williana Elizabeth	Thesis	Universidad Nacional Autónoma de Nicaragua SM QUIIND	Universidad Nacional Autónoma de Nicaragua SM QUIIND
Potencial de residuos agroindustriales para la síntesis de Carbón Activado: una revisión	M.V Vidal, Angie Rodríguez Suarez, Kennith Martínez Barrios, Joel Ocampo Pérez and Wilmar Barrios Lara	Research Article	Universidad Tecnológica de Pereira	Universidad Tecnológica de Pereira
Aprovechamiento de los residuos de cacao y coco para la obtención de carbón activado, en el cantón milagro, provincia del Guayas	Gabriela Elizabeth Burgos Campuzano & Jomayra Lorena Jaramillo Quiroz	Research Article	Universidad de Guayaquil	Universidad de Guayaquil
Optimización de parámetros para la construcción de la curva de ruptura en la adsorción de Cr(VI) sobre cáscara de cacao	Candelaria Tejada-Tovar, Ángel Villabona-Ortíz, Victoria Caballero Romero, Juan Paternina Cuesta, Clemente Granados Conde	Research Article	Revista U.D.C.A Actualidad & Divulgación Científica	Magazine / Journal
Adsorción de dióxido de carbono a diferentes presiones sobre carbones activados obtenidos por	Diana. P. Vargas, L. Giraldo, Juan Carlos	Research Article	AFINIDAD LXXI (journal in applied	Magazine / Journal

activación química	Moreno-Piraján	chemistry)