

Collaboration Agreement for the Establishment of a China-Algeria Joint Laboratory and for a Funding of the National Key R&D Program of China

I. Collaborative Content

This collaboration between Chinese and Algerian scientists aims to establish a joint China-Algeria laboratory, which seeks for being funded by the Special Program of Intergovernmental International Cooperation in Science, Technology, and Innovation for National Key R&D Program of the Ministry of Science and Technology, China.

The name of the joint laboratory is "China-Algeria Joint Laboratory on Advanced Industrial Applications of Clay Resources". The joint laboratory focuses on the efficient and high-value utilization of abundant clay mineral resources in China and Algeria, as well as the use of clay resources for oil and gas extraction, new green energy acquisition, and other important industrial applications. China and Algeria are both developing countries with some advantageous and distinctive clay mineral resources, such as palygorskite and halloysite, but their level of efficient and high-value utilization needs to be improved further. There is also a scarcity of high-value-added products, and there is an urgent need to develop clay-based new material products for pillar and emerging industries. Against this backdrop, the two sides of this project intend to collaborate to solve important scientific problems and key technical problems such as structure-property constraints of typical clay minerals in China and Algeria, purification and functionalization modification methods of the minerals, and development of clay-based mineral materials for oil and gas drilling construction. All partners will collaborate to publish high-level papers and, if applicable, apply for invention patents. The findings will be applied in the value-added utilization of common advantageous clay mineral resources in both countries, as well as in the fields of oil and gas drilling construction as additives in drilling fluids to enhance the performance and efficiency of the drilling process and the synthesis of important compounds for biomass energy, promoting the

efficient and high-value utilization of clay resources and the technological advancement of related industries in both China and Algeria.

II. Leading Scientists

Party A: Guangdong University of Technology

Principal Investigator: Prof. Dr. YUAN Peng

E-mail: yuanpeng@gdut.edu.cn

Tel.: +862039322296; Fax: +862039322296

Address: No. 100, Xiaoguwei Street, Panyu District, Guangzhou, China

Main Participants: Dr. ZHANG Baifa; Dr. ZHUANG Guanzheng; Dr. BU Hongling;
Dr. JIANG Xiaodong; Dr. ZHONG Yuanhong; Dr. ZHANG Xiaochun.

Party B: Université Oran 1 - Ahmed Ben Bella

Principal Investigator: Prof. Dr. BELAROUÏ Lala Setti

E-mail: belaroui.lalasetti@univ-oran1.dz

Tel.: +213551390055; Fax: +21341519217

Address: Faculté des Sciences Exactes et Appliquées, Université Oran1 Ahmed Ben Bella, BP 1524 Oran El M'Naouer, Oran, Algeria

Main Participants: Dr. BOCEIRI Nadia; BOUDAHRI Abderraouf.

Party C: Ecole National Polytechnique

Principal Investigator: Prof. Rezki AKKAL

E-mail: Rezki.akkal@g.enp.edu.dz

Tel.: +213698055519

Address: 10 Rue des Frères OUDEK, El Harrach 16200 Algiers Algeria

Participants: Dr. KHODJA Mohamed; Mrs. GUELLIL Khadidja.

Party D: Algerian Petroleum Institute / Algerian Academy of Sciences and Technologies

Principal Investigator: Dr. KHODJA Mohamed

E-mail: Mohamed.Khodja@Sonatrach.dz

Tel.: +213661654479

Address: Avenue 1 Novembre 35000 Boumerdès Algeria

Main Participants: Prof. AKKAL Rezki; Mrs. GUELLIL Khadidja.

III. Research Plan, Division of the joint Laboratory and Timetable

The project's goal is to develop novel applications of clays and clay minerals for oil and gas drilling additives and biomass-derived green energy. It will concentrate on the mineralogy research primarily on fibrous or tubular clay minerals and on granular clay minerals, clay minerals purification and functionalization in order to use as catalysis, adsorbent and composite materials, and efficient low-carbon applications of clay minerals. It is expected to form a complete value chain from clay mineral resources to high-efficiency and high-value applications, providing important support for both countries' technical progress and high-quality raw material supply in the petrochemical and new energy fields.

The China-Algeria Joint Laboratory on Advanced Industrial Applications of Clay Resources has three units. The three units are described in detail below.

UNIT 1: Mineralogy, resource, and environmental attributes of typical clay minerals resources in China and Algeria.

INVESTIGATORS: Prof. YUAN Peng, Prof. BELAROUÏ Lala Setti, Prof. LIU Mudan, Dr. ZHANG Baifa, Dr. ZHUANG Guanzheng, Dr. BU Hongling, Dr. JIANG Xiaodong, LI Bo, Prof. AKKAL Arezki, GUELLIL Khadidja.

The goal of this unit is to investigate the mineralogy and physical and chemical properties of clays (such as palygorskite, sepiolite, halloysite, and kaolinite) found in abundance in China and Algeria. The focus will extend to other properties such as thermal stability, mechanical strength, rheological behavior, and adsorption capacity that could be explored to gain a comprehensive understanding of clays' capabilities and limitations. Based on this, the clay minerals' resource attributes as industrial raw materials, environmental indicator minerals, and pollution treatment materials will be evaluated. Its goal is to provide a theoretical and experimental foundation for using the aforementioned clay mineral resources in energy and low-carbon industries.

UNIT 2: Purification and selective functionalization of clay minerals.

INVESTIGATORS: Prof. YUAN Peng, Prof. BELAROU I Lala Setti, Dr. BOCEIRI Nadia, Prof. LIU Mudan, LI, Bo, Dr. JIANG Ying, BOUDAHRI Abderraouf, Dr. ZHONG Yuanhong, Dr. KHODJA Mohamed.

The goal of this unit is to investigate the purification and surface selective or directional modification treatment methods of common clay minerals in China and Algeria in order to reveal the interface mechanism between the microstructure and surface group properties of clay minerals and their object molecules in order to obtain the optimization method of purified and functional clay minerals.

UNIT 3: Materials derived from clay minerals for the oil and gas industry and low-carbon applications

INVESTIGATORS: Prof. YUAN Peng, Dr. KHODJA Mohamed, Dr. ZHUANG Guanzheng, Dr. ZHANG Baifa, Dr. BU Hongling, Dr. ZHONG Yuanhong, Dr. ZHANG Xiaochun, Dr. AKKAL Rezki, GUELLIL Khadidja.

The goal of this unit is to conduct research and development in China and Algeria on high-efficiency oil and gas drilling mud based on clay minerals (e.g., palygorskite, halloysite, montmorillonite, kaolinite, etc.), clay-metal-based catalytic materials for biomass transformation, and green construction materials based on low-grade clays. To obtain the key optimization technology, the microstructure, properties, stability, and performance control methods, as well as related mechanisms under various conditions, of the above clay minerals will be revealed. It aims to increase the efficient and high-value application of clay resources in traditional energy fields like oil and gas, as well as emerging green and low-carbon fields like biomass energy in China and Algeria.

IV. Communication and Exchange

During the project's implementation, annual working meetings will be held at the respective locations of both parties to discuss project progress and future work, as well as to organize academic conferences related to the project's topic. In addition, there will be four person-time bilateral visits per year, with visitors including postgraduate students pursuing Master's or Ph.D degrees.

V. Sources of Funding and Its Use

Party A (Guangdong University of Technology; Principal Investigator: Prof. YUAN Peng) will seek for funding from the Ministry of Science and Technology of China in the amount of 2,000,000 Yuan CNY.

The money will be used to establish the China-Algeria Joint Laboratory for Advanced Industrial Applications of Clay Resources. The funding will be used in accordance with the Ministry of Science and Technology of China's regulations and requirements.

VI. Ownership, Use, and Transfer of the Intellectual Property

The collaboration's intellectual property rights (IPR) cover all results obtained through the collaborative project. The intellectual property rights (IPR) of the research findings will be shared by all parties involved. The intellectual property rights (IPR) of results obtained independently by one party without assistance from the other party, whether obtained before or after the collaboration, will belong to the respective party. Authorship and acknowledgment in papers should be determined by contributions to the project and agreed upon in discussions involving all parties involved. Before submitting any application for related IPR, one party should consult with the other party and may proceed only after the other party has agreed to the ownership of the IPR without objection. None of the project's common IPR can be transferred to a third party without the consent of both parties.

VII. Duration, Amendment, and Withdrawal

If the application is approved, the project will begin on January 1, 2024, and end on December 31, 2026. A research partner who decides to leave the project before the above-mentioned deadline must notify the other members of the collaborative research at least three months in advance. Any changes to this agreement must be approved by both parties.

VIII. Legal Validity

If the application is approved, this agreement will take effect on January 1, 2024, and will expire on December 31, 2026. It is made in two counterpart originals and two counterpart copies, with one original retained by each party and one copy retained by the Ministry of Science and Technology of China and the Ministry of Higher Education and Scientific Research of Algeria.

IX. Signature:

Party A:

Date:

Place: Guangdong University of Technology

Party B:

Date:

Place: University of Oran 1- Ahmed

Ben Bella

Party C:

Date:

Place: Ecole National Polytechnic



Party D:

Date:

Place: Algerian Petroleum Institute