PROCEDURES FOR REMOVAL SULFUR CONTENT FROM DIESEL AND JET FUEL

Contextualization

The growing concern about environmental pollution and its side effects on human health has attracted the attention of the scientific and industrial communities. The development of methods capable of eliminating pollutants can be a step forward in improving human and environmental well-being. This class of methods includes liquid-liquid extractions, production of nanomaterials and infrared.
Therefore, the 12th grade Chemistry students, working in partnership with the Balula´s group from REQUIMTE-LAQB, Department of Chemistry and Biochemsitry of Faculty of Science of University of Porto-perfoming desulfurization of real fuels by liquid-liquid extraction and also desulfurization by absorption using two diferente absorptive materials.

Introduction

The requirement to produce fuels with very low levels of sulfur (S < 10 ppm) has stimulated much work in the area of sulfur removal, i.e. desulfurization, to create technologies more environmental friendly. Desulfurization by extraction, using two immiscible solvents presents several advantages such as mild reaction conditions and no use of a high expensive chemicals. On the other hand, desulfurization method using materials with high sulfur absorptive capacity is also an economic strategy

Objectives and Methodology

This project proposes the development of efficient desulfurization methods using liquid-liquid extraction and materials with high capacity of sulfur compounds absorption. These materials are based in high surface silica nanoparticles and high porous size coordination polymers. These materials were also prepared during the project and their characterization was performed by infrared spectroscopy. Untreated real fuels as jet fuel and diesel will be treated.

Figure 1: Jet and diesel fuels (authors collection)

Procedures

Silica nanoparticles were prepared by dilution of Tetraethyl orthosilicate in ethanol, adding ammonia, using centrifugation to obtain nanoparticles.

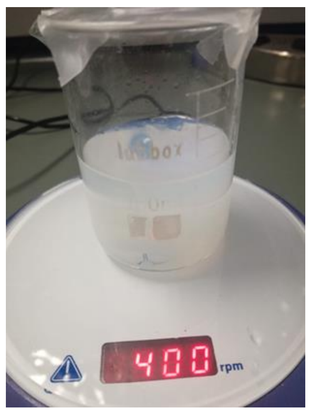

Figure 2: Work in progress (autor`s collection)

The pools polymer was prepared by preparing two solutions in methanol, a zinc nitrate and another with 2-Methylimidazole. Both solutions were homogenized using an ultrasonic bath. The solution precursor of metallic component added to the solution precursor of the organic component.

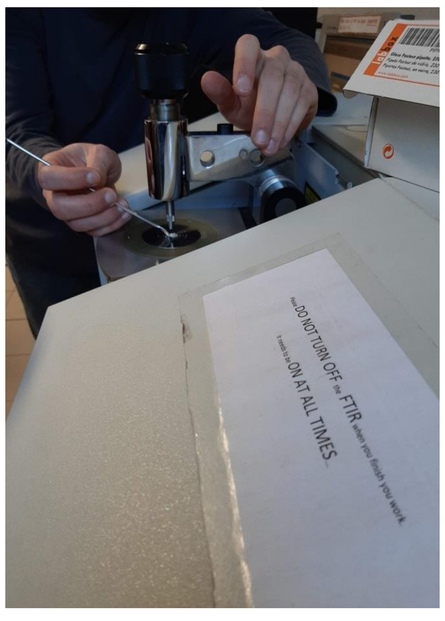

Figure 3: Students working (author`s collection)

The reaction mixture left on magnetic stirrer during 2 hours and 30 minutes. In the end, the resulting material was recovered by centrifugation and washed with methanol 4 times. The material was isolated by centrifugation and dried at 60ºC and 175mbar.

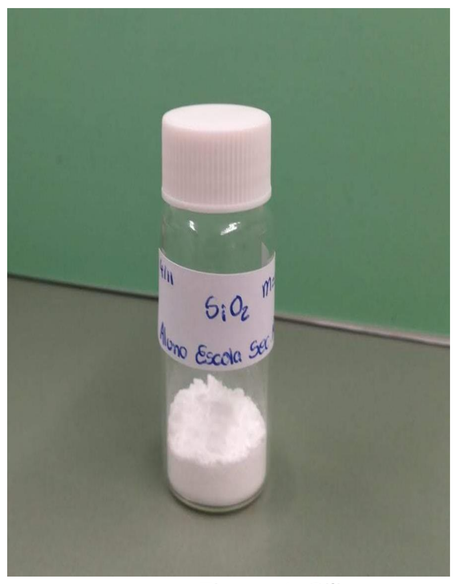

Figure 4: Silica nanoparticles (author`s collection)

Results

Due to Corona virus it was not possible to do the desulfurization of fuels.

Conclusions

By carrying out this project, students have developed personal skills and their ability to deal with the unknown as well as facing a challenge, always based on problem solving methodology. They have also developed social skills thanks to Balula's teamwork and contact with the entrepreneurial world.
Contacting with a research environment leads to the development of their ability to structure and analyse complex problems that require multidisciplinary skills as well as executing all tasks relating to each stage of the project in a lab environment

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