

## Utilization and reusability of Hydroxyethyl Cellulose Alumina based aerogels for the removal of spilled oil

Carolina Simón, Amaya Romero, Adrián Esteban-Arranz, Ana Raquel de la Osa and Luz Sánchez-Silva

Department of Chemical Engineering, University of Castilla La Mancha, Av. Camilo José Cela 12, 13071 Ciudad Real, Spain

Presenting Author: [Adrian.Esteban@uclm.es](mailto:Adrian.Esteban@uclm.es)

The continuous need for energy worldwide has resulted in the extraction, refining, production, transportation, storage and use of large amounts of oil. Millions of tons of oil are accidentally spilled into the environment each year, causing important health, environmental, safety and economical problems [1]. Thus, there is an urgent need to develop new technologies and materials to remove spilled oil from the environment. In this study, hydroxyethyl cellulose (HEC) alumina-based aerogels were synthesized by an environmentally friendly freeze-drying process to be used as sorbents for oil spills [2]. The effect of HEC/Aluminium tri-sec-butoxide (ASB) ratio on the physicochemical characteristics of the resulting aerogel materials was determined. Materials produced from greater HEC/ASB ratios presented higher apparent density values, more compact structures and smaller size of pores. In addition, the incorporation of HEC enhanced the mechanical properties of the final aerogel.

Regarding the retention coefficient of the different materials for the spilled oil, it was demonstrated that the sorption capacity depended on the viscosity of the oil and the amount of HEC that was presented in the aerogel. Thus, the aerogel with a 10 % of HEC was selected as the best candidate due its better physicochemical and morphological properties, achieving 5.5 times its weight in comparison to its dry state. In addition, regeneration experiments by washing the aerogel after the oil sorption with two solvents, acetone and ethanol, for short and longer times, were carried out. It was concluded that after a long washing step of the sorbent with acetone after the oil retention, better results were obtained, reaching a weight gain of 38.7 %.

### Acknowledgements

The present work was performed within the framework of the NANOLEAP project, which received funding from the European Union's Horizon 2020 research and innovation program under the grant agreement N° 646397.

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