POLYUREA-CROSSLINKED ALGINATE AEROGELS WITH NO NEED FOR SUPERCRITICAL DRYING

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One of the most critical steps in the synthetic procedure of aerogels is the drying step, as this step must ensure the preservation of the porous network of the wet gel into the dry object, and thus the unique material properties of aerogels. The best drying method is drying from supercritical CO_2. In the frame of developing new sustainable processes and aerogel products, research has been intensified for biopolymer-based aerogels and towards replacing supercritical drying with more conventional and more green drying methods. In this work, polyurea-crosslinked M-alginate (X-M-alginate, M: Ca, Cu, Zn, Ag) have been prepared via the reaction of pre-formed M-alginate gels with an aliphatic triisocyanate derived from isophorone diisocyanate. Crosslinking with polyurea has proven to be an efficient way to increase the mechanical strength and the stability of alginate aerogels [1,2], improving therefore their application potential. X-M-alginate gels were dried from (a) supercritical CO_2 (SCD) or (b) low vapor pressure solvents. SCD provided macroporous/mesoporous X-M-alginate aerogels with BET surface areas in the range of 300-500 $m^2\ g^{-1}$ and porosities >90% v/v, while drying from low vapor pressure solvents provided mostly mesoporous aerogels with BET surface areas in the range of 300-400 $m^2\ g^{-1}$ and porosities in the range of 75-90% v/v. The fact that aerogels obtained from conventional drying retain high surface areas and porosities can be attributed to the rigid structure of the aliphatic polyurea.

Acknowledgements

This publication is based upon work from COST Innovators Grant (2023-2024) “Technical, commercial and societal innovations on aerogels towards circular economy” (ECO-AERoGELS, ref. IG18125 CA18125), supported by COST (European Cooperation in Science and Technology). Funding from the Special Account for Research Grants of the National and Kapodistrian University of Athens is gratefully acknowledged. Covestro AG is also acknowledged for the generous supply of polyisocyanates.

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