PHOTOPOLYMERIZATION OF ZEOLITE/POLYMER-BASED COMPOSITES: TOWARD 3D AND 4D PRINTING APPLICATIONS

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3D printing *via* photopolymerization is developing rapidly and has been a turning point of additive manufacturing (AM).[1] However, the lack of appropriated mechanical properties and functionalities of pure polymer products produced by 3D printers limits their wide applications in the future.[1] Many functional fillers can be introduced into polymers to improve their mechanical properties and functionalities, such as zeolites, which have large specific surface area, high thermal stability and good adsorption performance.[2]

Here, we report the fabrication of zeolite/polymer based composite *via* photopolymerization. The results show that the zeolite filler content of this composite can reach at least 70 wt%, with good depth of cure and excellent improved mechanical properties. Although the issue of light penetration in filled samples is unavoidable, the production of 3D patterns can be performed through direct laser write (DLW) as a lithography technique. Remarkably, a high zeolite porosity can be obtained with the 3D-printed structure, after debinding of the 3D-printed composite by thermal treatment. Compared with the corresponding pure zeolite powder, the porosity is only slightly reduced, which means these materials can be applied in field of adsorption and separation.

In conclusion, this work is expected to lead to valuable developments of highly filled composites in the field of photopolymerization, and expand their potential application for 3D printing in the field of high-performance lightweight materials and adsorption.

[1] Zhang Y., Xu Y., Simon-Masseron A., Lalevée J., Chem. Soc. Rev. 2021, DOI: 10.1039/D0CS01411G

[2] Zhang Y., Josien L., Salomon J.-P., Simon-Masseron A., Lalevée J., ACS Appl. Polym. Mater. 2020, 3(1), 400-409.