Synthesis and Characterizations of Zeolite Carbon Template over BEA Zeolite

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Zeolite Template Carbons (ZTCs) with their large specific surface areas (> 2000 m^2/g), nano-ordered structure, thermal stability, and electric conductivity represent promising supports for metallic catalysts and potential electrocatalysis applications. However, their synthesis can still be improved to tune their physico-chemical and textural properties. In this work, ZTCs were prepared with different synthesis conditions and characterized.

ZTCs composites were synthesized from homemade BEA-25 zeolites via Chemical Vapour Depositions of various carbon sources at high temperatures [1]. ZTCs were obtained after dissolving the zeolite framework via acid treatment (HF and HCl) [2]. Final ZTCs samples were characterized through X-ray diffraction (XRD), N_2 porosimetry, thermo-gravimetric analysis (TGA/DTA), temperature-programmed desorption of ammonia (NH_3-TPD), and Raman spectroscopy.

XRD results of the prepared β-ZTC indicate a good 3D replication of the zeolite framework. No evidence of the formation of graphite was found. TGA analyses present a single convoluted peak at 600 °C, indicating the presence of several species of carbon in line with measured Raman Spectra. Moreover, the total mass loss, observed at T > 750 °C, indicates the zeolite matrix's total dissolution after the acidic treatment. BET surface areas larger than 2000 m^2/g with a high degree of microporosity were obtained. Finally, NH_3-TPD analyses indicate a negligible surface acidity.

New insights are given in this work, in a perspective widening of the application portfolio (from electro- to metal supported catalysts) of these materials.

References

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