

Removal of zeolite templates using NaOH and HCl instead of HF in templated synthesis of ordered microporous carbons

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Synthesis of zeolite-templated carbons (ZTCs) is gaining increasing attention for the preparation of ordered microporous carbons. However, the carbon synthesis mostly uses toxic HF to remove the zeolite. Here, we studied the zeolite removal using NaOH and HCl solutions instead of HF. We were able to optimize the NaOH-HCl treatment procedures. The NaOH-HCl-washed ZTCs exhibited an improved supercapacitor performance in K_2SO_4 (aq) at high current density. The increase in supercapacitance was attributed to the oxygen functionalization of ZTC by the washing with NaOH, which increased the wettability of carbon micropores and thus facilitated the electrolyte transportation. By contrast, the ZTCs exhibited a lower performance in a non-aqueous medium. This was ascribed to the decrease of hydrophobicity and the electrical conductivity. We found that the conductivity and electrochemical characteristics of the ZTC were restored to the level of HF-washed carbons when the carbon was heated in H_2 . We also demonstrate that the NaOH-generated oxygen functionalities could be used as a base to graft organic functional groups.