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Nitrogen-Doped Carbon Materials for Hydrogen Storage

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Microporous carbon materials show many advantages such as high surface area, large pore volumes, structural flexibility and thermal stability, lightweight, fast kinetics, diverse availability, and facile preparation strategies. This could make microporous carbons strong candidates for energy storage. We present here the preparation of a series of carbonized materials by using nitrogen-rich hypercrosslinked porous organic polymer as the precursor. The influence of carbonization temperature and the chemical agent of potassium hydroxide on the pore structure (surface area & pore size) of the carbonized materials will be discussed. In addition, the hydrogen uptake ability by the resulting carbonized materials was also studied. It was found that the carbon materials with a high surface area of up to 3400 m^2 g^{-1} and an exceptionally high hydrogen uptake ability of 3.1 wt % (1.13 bar/77 K) could be obtained by optimizing carbonization conditions and selecting a nitrogen-rich hypercrosslinked porous organic polymer precursor. The result demonstrated that these novel carbonized materials are very promising for high-density clean energy storage such as hydrogen storage.

Keywords: hypercrosslinked porous polymer; carbon material; carbonization; surface area; hydrogen storage