HYDROGEN STORAGE

Cigarettes butt in

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It is estimated that around 800,000 tonnes of cigarette butts are generated globally each year, posing challenges with regard to waste disposal and, due to the contaminants within cigarettes and the non-biodegradable nature of one of the major components (cellulose acetate), potential pollution hazards. Valorization of such waste by conversion into useful products presents an attractive approach to tackle the problem. Now, Troy Scott Blankenship and Robert Mokaya from the University of Nottingham, United Kingdom, synthesize a carbon material with promising hydrogen storage capacity starting from used cigarette filters.

The researchers first separate the filters from the wrapping papers before they are ground, hydrothermally carbonized and activated in KOH. The porosity can be tuned by varying the activation temperature and amount of KOH, but this is complicated by the presence of metal ions (such as K, Ca, Na and Mg) found in the starting material, which can serve as activating agents themselves, in addition to the KOH. The resulting optimized material has a large pore volume of 2.09 $cm^3 g^{-1}$ and a high surface area of 4,300 $m^2 g^{-1}$, 90% of which arises from the micropores within the structure. These attributes, coupled with the substantial amount of oxygen-containing functional groups in the material, are proposed to give rise to the high total hydrogen uptake of 11.2 wt% at −196 °C and 40 bar, challenging the state of the art.

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