Flexible nanoporous activated carbon cloth for achieving high H2, CH4, and CO2 storage capacities and selective CO2/CH4 separation

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Innovative tools are needed for the synthesis of smart, new, efficient, and safe nanoporous carbon materials for energy gas storage. Here, a flexible nanoporous activated carbon cloth was developed. Polypyrrole nanoparticles were polymerized in dispersed form on commercial viscose rayon cloth fiber surfaces. Then, the material was carbonized and activated by physical and chemical activation methods applied individually. Chemical activation conditions were varied and optimized. This produced a high porosity flexible nanoporous carbon textile with a surface area of ~2000 m2 g−1, total pore volume of 0.85 cm3 g−1, and high nitrogen content. The new flexible nanoporous carbon cloth achieved superior H2 and CH4 storage capacities and CO2 capture compared to so-far-reported activated carbon cloth, and values were comparable to or higher than those reported for powder activated carbons.