

## Carbide-Derived Carbons for Hydrogen Storage

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Cryo-adsorption is a promising method of enhancing gravimetric and volumetric onboard H<sub>2</sub> storage capacity for the future transportation needs. Inexpensive carbide-derived carbons (CDC), produced by chlorination of metal carbides, have 50-80% open pore volume with tunable pore size and high specific surface area (SSA). Tuning the carbon structure and pore size with high sensitivity by using different starting carbides and chlorination temperatures allows rational design of carbon materials with enhanced C-H<sub>2</sub> interaction and thus increased hydrogen storage capacity. Systematic experimental investigation of a large number of CDC with controlled pore size distributions and SSA show that smaller pores increase both the heat of adsorption and the total volume of adsorbed H<sub>2</sub>. It has been demonstrated that increasing the average heat of H<sub>2</sub> adsorption above 6.6 kJ/mol substantially enhances H<sub>2</sub> uptake at 1 atm and -196 °C. H<sub>2</sub> storage measurements on CDC of various particle size and surface termination at up to 60 atm will be presented and materials challenges for designing advanced carbon-based adsorbents will be discussed.