Experimental Measurements and DFT of Adsorption of Methane, Water and Their Mixtures on Activated Carbons

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The physico-chemical phenomena occurring at interfaces, as for instance wetting, adsorption, and confinement effects, have a deep influence on the static and dynamic thermophysical properties of fluids confined in porous media. This work aims at studying the adsorption of pure methane, pure vapor water and their binary mixtures in porous confined media. From an experimental point of view, adsorption isotherms for pure components are measured on a magnetic suspension balance [1], coupled with a homemade steam generator that allows investigating P-T ranges above ambient conditions. For binary mixtures, an apparatus has been specifically developed based on a manometric technique [2] coupled with a compositional analysis system. From a theoretical approach, a Density Functional Theory that uses the SAFT-VR equation of state and weighted density approximations, was developed for non-associating and associating monomers in order to determine the adsorption behaviour of methane [3], water and their binary mixtures at pore scale. After a characterization of the sample through a correct determination of its pore size distribution, the experimental results are compared with modeled adsorption isotherms.