

Influence of Silica Surface Hydrophilicity on Adsorbed Water and Isopropanol Studied by in-situ NMR

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Abstract : Surface wettability is a crucial factor in oil recovery. In oil industry, the rock wettability involves the interplay between water, oil, and solid surface. Therefore, studying the interplay between adsorptions of water and hydrocarbon molecules on solid surface would be very informative for understanding rock wettability. Here we use the in-situ Nuclear Magnetic Resonance (NMR) gas isotherm technique to study competitive adsorptions of water and isopropanol, an intermediate step from hydrocarbons. This in-situ NMR technique obtains information on thermodynamic properties such as the isotherm, molecular dynamics via spin relaxation measurements, and adsorption kinetics such as how fast the system can reach thermal equilibrium after changes of vapor pressures. Using surfaces of silica glass beads, which can be modified from hydrophilic to hydrophobic, we obtained information on the influence of surface hydrophilicity on the state of surface water via obtained thermodynamic and dynamic properties.

Keywords : Wettability, NMR, Gas Isotherm, Hydrophilicity, adsorption

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