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Adsorption Behaviour of Chloroauric Acid, a Generic Adsorbing Tracer, for Finding Wetting Behaviour of Fluids in Oil and Gas Industry

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Tracers are widely used to study physical phenomena taking place inside reactors like studying the hydrodynamics of the reactor by residence time distribution or characterising the oil reservoirs for heterogeneity and residual oil saturation. Dual tracer method, which uses one adsorbing tracer and one non adsorbing tracer, is used to characterize the reactors for wetting efficiency of the fluid in gas liquid reactors (trickle bed reactor). Non-adsorbing tracers are well studied in the literature. Chloroauric acid (HAuCl4.3H2O), with Au-198 as gamma emitter, is a tracer that adsorbs on the solid surface, therefore can be used as an adsorbing tracer. It is adsorbed on the surfaces that are easily protonated like silicates (albite, quartz, feldspar), chitosan, polymers and a wide variety of surfaces. This adsorbing behaviour makes chloroauric acid a potential generic adsorbing tracer for oil and gas industry. Glass beads are used in lab scale reactor experiments to form a porous medium. Therefore, adsorption kinetics and dynamics of chloroauric acid on glass surface will impact the characterization of the reactor using the two tracer technique. In the present work, adsorption isotherms and adsorption kinetics of chloroauric acid on glass surface are studied. Non-radioactive form of chloroauric acid is used for this study which can be translated to radioactive gold chemical for better accuracy at industrial scale.

UV-visible spectrophotometer, at different wavelengths is used for concentration measurement of non-radioactive chloroauric acid in the chloroauric acid solution. In UV-visible spectrophotometer, UV or visible rays are passed through the sample. The absorbance of the incident rays of a particular wavelength follows Beer Lambart's law, and is proportional to the concentration of chloroauric acid in the sample. Batch adsorption studies are carried out using glass beads and change in concentration of the solution is measured with time by UV-Vis spectrophotometer.

The adsorption and desorption behaviour of chloroauric acid on glass beads is obtained for different tracer concentrations. For chloroauric acid, the pH and chloride ion concentration are found to impact the adsorption - desorption behaviour on the glass surface. The results obtained will be used to characterize the lab scale porous medium for wetting efficiency.

Country/Organization invited to participate

India

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