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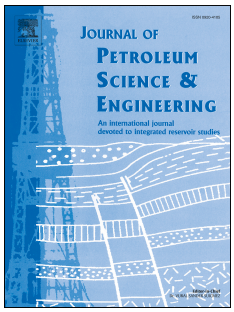

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Experiment and Analysis of the Reaction Kinetics of Temperature Control Viscosity Acids with Limestone

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Abstract

One of the advantages of temperature control viscosity acids is that its viscosity can change during the different stages of the simulation. That results in it has been used widely in acid fracturing for etching inhomogeneous, controlling the leak-off, and reducing the reaction rate for deep acid penetration. The reaction kinetics of temperature control viscosity acids to rocks have to be considered carefully before operating stimulation of oil-and-gas wells. In our work, a study of the reaction kinetics of temperature control viscosity acids with limestone is conducted by using a rotating disk apparatus. The rheological result reveals that temperature control viscosity acids exhibits the characteristics of non-Newtonian shear thinning fluids. The results indicates that the reaction of temperature control viscosity acids to limestone is mass transfer limited under the experimental conditions. The relationship between the reaction rate and the shear rate can be expressed by a binomial formula which can predict the surface reaction rate. With the shear rate increasing, the reaction rate rises. The effective diffusion coefficient of H^+, the reaction rate coefficient, the reaction order and the activation energy are calculated based on the experiment result. The effect of the acid concentration and temperature on the mass transfer rate of H^+ and the surface reaction rate are discussed too.

Keywords

Reaction rate; Limestone; Temperature control viscosity acids; Rotating disk; Mass transfer; Viscosity