



Incorporation of Ionic Liquid (ILs) In Commercial Solvent Agents for Better Downhole Reaction

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Abstract

Solvent agent is important to effectively control the solid formation and precipitation in an industrial oilfield production. The commercial chemical solvents must be effective to control and remove the chemical ions such as calcium, magnesium and iron which are regularly caused solid scale precipitation as for example in the well stimulation. The incorporation of ionic liquid (IL) in the presence of commercial solvent would increase the performance and efficiency to remove and control solid scale or precipitation through ionic bonding and electrostatic interactions. At present, a trial and error approach is used by a petroleum engineer without understanding the mechanism on how the solvent and ionic liquid play a role at the molecular level to control the solid formation and dissolution in an oilfield environment. The molecular modelling work would benefit the industry to further understand the chemical interaction mechanism between solvent agent, ionic liquid and solid such as sand stone. From molecular dynamics simulation approach and application, the solution structure and mass transfer rate can be understood as an input for petroleum engineers and operators to control the dissolution and precipitation of solid in oil field environment and well. Setegap Ventures Petroleum (SVP) Sdn. Bhd. would apply the knowledge of industrial computational calculation and physical chemistry of solvent agent and ILs to improve and increase the existing solvent performance in their daily industrial application and operation. Hence, the knowledge would benefit and enhance the technical staffs (petroleum engineers and operators) in the SVP actual operation. The ILs technology also would solve the present industrial problem in particular in well stimulation to remove the target solid scale.

Keywords: Solvent agent, ionic liquid, solid scale, molecular dynamic simulation

1. Introduction

Solvent agents are chemicals alternative to acid that are used to control undesirable reactions of metal ions that cause precipitation of solid scale in well formation and tubing. In oilfield chemical treatments, solvent agents are frequently added to stimulation acids to prevent precipitation of solids as the acid spends on the formation being treated (Freinier et al, 2000). Some of the major solid scale precipitation in oil and gas are calcite, barite and iron sulphide. Solid precipitation however heavily depends on the ions present and often a mixed of various component of metal precipitation. The deposited material forming scale has been considered as one of a major problem in oil and gas production (Dunn & Yen, 1999). One of the recorded scale problems was in the North Sea, Miller field where scale causes the production fall from 4770 m³/d to zero in just 24 hours (Brown, 1998).