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Evaluation of Scleroglucan for Polymer Flooding in High-Temperature, High-Salinity Carbonate Reservoir Conditions

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SUMMARY

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Introduction

Polymer flooding is a proven chemical enhanced oil recovery (EOR) method for sandstone reservoirs. However, its full potential in high temperature and high salinity Middle East carbonate reservoirs remain unexplored due to the harsh reservoir conditions, geological heterogeneities with complex porosity systems and oil-to-mixed wet matrix properties. This paper evaluates the performance of biopolymer Scleroglucan for polymer flooding in high temperature, high salinity carbonate reservoir conditions as compared to other conventional EOR polymers like HPAM and Xanthan, which fails to withstand these conditions.

The polysaccharide Scleroglucan shows shear thinning behavior with remarkable thermal stability at 120 °C and salinity tolerance up to 220 g/l. Static adsorption on pure calcite and reservoir rocks have found to be low in magnitude. In-situ rheology, injectivity as well as dynamic adsorption have also been reported. Identification of thermally stable, salt-tolerant biopolymer with high thickening efficiency, good injectivity, low retention and promising recovery efficiency in carbonate reservoirs will be a major step towards the application of Scleroglucan for polymer flooding in high temperature and high salinity carbonate reservoirs.

Methodology

- Rheology
  - Effect of concentration
  - Effect of hardness on viscosity
  - Effect of overall salinity on viscosity
  - Effect of temperature on viscosity
- Static Adsorption
  - Adsorption on calcite, dolomite, kaolin and silica
  - Adsorption on crushed reservoir rock
- Porous media studies
  - Injectivity
  - In-situ rheology
  - Dynamic adsorption
  - Effluent rheology