InterPore
InterPore 10th Annual Meeting and Jubilee
May 14-17 2018, New Orleans, USA
interpore.org/neworleans

LSU **Tulane University**

Contribution ID: **281**   Type: **Oral 20 Minutes**

On Determining the Onset of Asphalt Precipitation using Electrical Conductivity Measurements

Tuesday 15 May 2018 10:08 (15 minutes)

An important and largely unsolved problem is accurate prediction of the onset of precipitation of heavy organic compounds, such as asphalts, on the surface of the pores of a porous medium, such as oil reservoir. It was suggested some time ago that an effective method of identifying the onset may be through measuring the electrical conductivity of the solution that contains the heavy organic compounds. We test this hypothesis by carrying out computer simulation studies of asphalt flocculation and precipitation processes, utilizing two models of asphalt

formation that have been suggested in the past, namely, those that are based on diffusion-limited and reaction-limited aggregation processes. The simulations model the evolution of the asphalt aggregates as the precipitation agent is added to the solution, and computes the electrical conductivity of the solution as a function of time and the concentration of the asphalt aggregates.

The results indicate that, regardless of the aggregation model, under certain conditions the points at which the aggregates begin flocculating and precipitating induce discernable changes in the conductivity of the solution at particular points. The same changes are detectable in the number of the asphalt aggregates in the solution. However, the changes happen only if the concentration of the asphalt in the solution is relatively high. Otherwise, the electrical

conductivity of the asphalt-containing solution exhibits no special feature and, therefore, its measurement is not an accurate method for identifying the onset of asphalt precipitation.

References

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Session Classification: Parallel 3-C

Track Classification: MS 2.04: Transport phenomena in solvent-aided thermal recovery of heavy oil and bitumen