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Molecular Diffusivities of Asphaltene Monomers by Fluorescent Correlation Spectroscopy BALLARD ANDREWS, Schlumberger-Doll Research, RODRIGO GUERRA, Harvard University, PABITRA SEN, Schlumberger-Doll Research, OLIVER MULLINS, Schlumberger-Doll Research — Many analytical techniques have been applied to elucidate the properties of asphaltenes due to their extraordinary importance in the petroleum industry. However, many fundamental issues such as the molecular size are still in debate. Using Fluorescence Correlation Spectroscopy (FCS) we measure the translational diffusion coefficient of asphaltene molecules in toluene at extremely low dilutions. To avoid focal volume artifacts common in FCS we use a scaling procedure to determine asphaltene diffusivities relative to known molecules such as porphyrins, perylene and quantum dots. We estimate a diffusion coefficient for the asphaltene molecules of 0.3, 10^{-5} cm^2/sec at room temperature. This value agrees with recent estimates from NMR studied at 10-100 fold higher concentrations. The Stokes-Einstein equation implies that the unaggregated hydrodynamic diameter of asphaltene monomers is 15-25 Å.

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