

The Effect of Molecular Structure on Liquid Viscosity and Density

Brayton Young^{1, S}, Neil Giles¹, Thomas Knotts¹ and Vincent Wilding^{1, C}

¹*Chemical Engineering, Brigham Young University, Provo, UT, U.S.A.
vincent_wilding@byu.edu*

Liquid viscosity is an important property in both scientific and industrial applications. Knowing the values of viscosity with sufficient accuracy is essential for many processes. For this reason, accurate experimental measurements are performed, and when measurements are not possible, prediction methods are used to obtain estimated values. However, even the best prediction methods often have difficulty accounting for subtle changes in molecular structure. This study describes how many prediction methods struggle to account for changes in molecular structure that significantly affect viscosity. Understanding how these changes in structure affect viscosity can lead to better prediction models. The viscosity and density of several different chemicals were measured using an Ubbelohde-Type Capillary viscometer provided by SI Analytics and an Anton Paar DMA 5000 Density Meter. Data that were not measured but used for comparisons were obtained from the DIPPR 801 Database. Results from our study show that subtle changes in structure can have significant impacts on liquid viscosity and density and in turn impact the prediction capabilities of many models. To improve the accuracy of prediction models, these types of changes in structure need to be accounted for.