

Application of the One-Third Rule for Estimating Hydrocarbon and Crude Oil Properties

Francisco Vargas^S and Walter Chapman^C

Chemical and Biomolecular Engineering Department, Rice University, Houston, TX, U.S.A.

In this work we present a new equation that relates the refractive index of a substance with its mass density. The only parameter of this model, which has a physical meaning, is equal to one-third, for hydrocarbons and crude oil systems. Although both the refractive index and the mass density are functions of temperature, it has been found that the parameter of this model is nearly invariable over a wide range of pressures and temperatures. Therefore, if we knew the temperature dependence of one of the variables, it would be possible, by applying the so-called One-Third rule, to estimate the temperature dependence of the other variable. This correlation was validated with over 200 crude oil samples, in a wide range of densities (10-55°API) and temperatures (10-70°C), and the results obtained are remarkable. The applications of the One-Third rule in the calculation of the solubility parameter and other properties of hydrocarbons and crude oil systems, as a function of the mass density, are presented and discussed. The method presented in this work is promising in offering a new, simple and reliable method for estimating hydrocarbon and crude oil properties, as a function of the mass density, when no other data are available.