Densities and refractive index for the ternary system ETBE+ ethanol+ benzene and the binary sub-systems

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Various oxygenated compounds, such as methyl tert-butyl ether(MTBE) and ethyl tert-butyl ether (ETBE) have been suggested as fuel additives that either alone or with other ethers or alcohols can enhance the octane rating and reduce the pollution effects arising out of the combustion process. But the U.S. fedral government unveiled a plan to phase out MTBE because of recent concerns of the contamination of underground drinking water. This actions have necessaritated additional studies on the properties of mixtures of the other ethers with hydrocarbons.
In this work, densities and refractive index at 298.15 K are reported for the binary systems ETBE + ethanol, ethanol + benzene and ETBE + benzene, and the ternary system ETBE + ethanol + benzene. The excess molar volumes and changes of refractive index of the binary and ternary systems were derived and correlated with the Redlich-Kister and Cibulka equation for the binary systems and the ternary system. The binary data were compared with the values in the literatures, and the ternary data were also compared with the predicted values using the binary contribution models of Tsao-Smith, Kohler, Rastogi and Radojkovic.