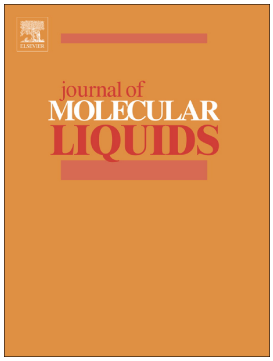

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High-cetane additives for diesel based on polyoxymethylene dimethyl ethers: density behavior and prediction

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Abstract

Polyoxymethylene dimethyl ethers ($PODE_n$) have aroused widespread industry interests due to the prospects for clean fuel additives or substitutes. The densities of liquid $PODE_n$ were measured with an oscillation tube densimeter and fitted with the Racket equation. The self-expanding empirical density model has been developed to predict the densities of $PODE_n$ whose pure and reliable monomer could not be readily available. The density behavior of PODE-PODE mixtures, $PODE_3$-*n*-hexadecane and $PODE_3$-tetralin blends was studied. Results showed the excess volumes of PODE-PODE are negative and approximately equal to zero, indicating PODE-PODE mixtures could be regarded as regular solution at temperatures from 273.15 to 363.15 K. While the excess molar volumes of $PODE_3$-hexadecane and $PODE_3$-tetralin blends are positive over the complete mole fraction range. The breaking of self-association of the $PODE_3$ molecules by dilution effect might make a positive contribution to excess volume besides physical interactions. The densities of practical $PODE_n$-diesel blends were estimated and results agreed well with experimental data.

Keywords: polyoxymethylene dimethyl ethers; density; excess molar volume; diesel blends

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