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Measurement and correlation of densities and viscosities of pure 1,7-dibromoheptane and 1,7-dibromoheptane in ethanol at temperatures from 288.15 to 323.15 K

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ABSTRACT

The densities and viscosities of pure 1,7-dibromoheptane and 1,7-dibromoheptane in ethanol had been determined from 288.15 to 323.15 K. The relative viscosities were correlated using the Carl L. Yaws equation. The results showed that the model agreed very well with the experimental data.

1. Introduction

1,7-Dibromoheptane is an important pharmaceutical intermediate, commonly used in drugs, chiral macrocyclic ligands, long-chain fatty alcohol and the synthesis of cationic surfactant, and is widely used in the fields of pharmacy, bionic chemical, petroleum, food, cosmetics. In the synthesis and purification process of 1,7-dibromoheptane, it is useful to know the basic data of densities and viscosities of 1,7-dibromoheptane and its solution. The densities and viscosities are very important data in chemical engineering design, process optimization, and molecular thermodynamic study of solution. In this study, densities and viscosities of 1,7-dibromoheptane and its solution are measured from 288.15 to 323.15 K. From measurements of densities and viscosities, the relative viscosities of 1,7-dibromoheptane in ethanol are calculated and correlated using the Carl L. Yaws equation. Results are fit to obtain the adjustable parameters and standard deviations between the measured and fitted values. These parameters had certain practical value for the design and synthesis of 1,7-dibromoheptane.

2. Experimental section

2.1. Materials

1,7-Dibromoheptane and ethanol were of AR grade and obtained from Shanghai Chemical Reagent Co. All the liquids were stored in dark bottles over 0.4 nm molecular sieves to reduce the water content and were degassed before use. The estimated purities as per gas chromatographic analysis were better than 99.5 mol% for all liquid samples. Further, the purities of liquids were checked by comparing the measured densities and viscosities with those reported in literatures [1,2]. The double-distilled and degassed water used in the experiments was deionized and its conductivity was less than 5 $\mu S\ m^{-1}$.

2.2. Measurements of densities

The density of the mixtures and the corresponding pure substances were measured with an Anton Paar Model DMA 5000 digital vibrating U-tube densimeter, with automatic viscosity correction and a stated accuracy of $\pm 5 \times 10^{-6}$ g cm^{-3}. The temperature in the cell was regulated to ±0.001 K with a built-in solid-state thermo-stat. It was measured by means of two integrated Pt 100 platinum thermometers, and its stability was better than ±0.002 K. The reliability of the apparatus was verified daily with dry air and distilled freshly degassed water. To minimize the errors

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