

Density and Speed of Sound Measurements of 1- and 2-Butanol

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The density and speed of sound of 1- and 2-butanol have been measured because these alcohols are becoming important as second-generation biofuels. Data were collected utilizing two instruments, both of which measure density via the vibrating-tube technique. Ambient pressure density and speed of sound measurements were made from 278.15 K to 343.15 K with a rapid characterization benchtop instrument. In addition, compressed-liquid densities were measured from 270 K to 470 K at pressures from 0.5 MPa to 50 MPa with a fully automated vibrating-tube instrument. Density data for 1-butanol are readily available in the literature over the temperature and pressure range of our measurements; however, there is significant scatter in the data particularly in the compressed-liquid region. To help resolve some of the discrepancies in the literature data, we have fitted our 1-butanol compressed-liquid densities to a Tait equation and will compare existing correlations of literature data with ours. Density data for 2-butanol are scarce; thus, our measurements fill a gap in the thermophysical properties knowledge of this fluid. A survey of the literature found speed of sound data for both butanols at ambient pressure only, and to temperatures of 318 K for 1-butanol, and 313 K for 2-butanol. Therefore, our speed of sound measurements extend the range of available data. Differences in the thermophysical properties and stability of the butanol isomers will be discussed.