

Corresponding States for Transport Properties

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Recent work by the author has resulted in a computer package which allows for the estimation of thermal physical properties of a fluid, when very little information is known about that fluid. The minimum required data set for the method is the molecular weight, density, viscosity, thermal conductivity, and temperature of the liquid at the normal boiling point. The method utilizes the application and modification of the extended corresponding states model. Using a well known reference fluid, or fluids, and the above minimum data set for a target fluid (the fluid for which properties are desired), thermodynamic and transport properties may be estimated over a wide range of pressure and temperature. Depending on the target fluid and the availability of a suitable reference fluid, the method may use as many as five reference fluids, but it usually uses three or less. Although the minimum data set for the target fluid is described above, the availability of more data for the target fluid greatly improves the accuracy of the method. Even an additional one or two data points for the target fluid helps and the more data available for the target fluid, the greater the help. The goal of the work was to develop a method and subsequent computer package which would provide thermodynamic and transport properties for a target fluid with a minimal amount of known data for that fluid, and that the resulting properties for the target fluid be of sufficient accuracy to be useful in engineering calculations. It is believed that this goal has been achieved. Typical accuracy assessments and examples are presented. Since, traditionally, transport properties have not corresponded well, and since presenting both the thermodynamic and transport property methods would make this paper much too long, only the transport properties part of the package is presented here. This work was funded by the George C. Marshall Space flight Center in Huntsville, Alabama, and is included in a version of Cryodata's GASPAK properties calculation computer program used by the propulsion division at NASA Huntsville. The version of GASPAK containing the generic equation of state has not yet been released to the public.