Prediction Methods for Thermal Conductivity of Organic Liquids

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Thermal conductivity of liquids is an important transport property required in all heat transfer properties. Therefore prediction of thermal conductivity plays a major role in industrial design. Due to the lack of a consistent theory of the liquid state, theoretical prediction methods are useless for the prediction of thermal conductivity (either for their mathematical complications or for the large number of properties required in order to apply them). Empirical or semi-empirical methods are, therefore, the most often used way to predict thermal conductivity of liquids and its dependence upon temperature. Different approaches have been attempted by different authors, from pure empirical correlation to methods based on the group contribution theory, from family correlation methods to methods based on the corresponding states theory. In the present article several thermal conductivity estimation methods developed for organic liquids are presented. A selection of these methods is performed, based on the requests of industrial purposes. These selected methods are compared by testing their errors on a wide database of experimental values. The database used for the test is very large and comprehends all most common organic refrigerants. Tests are performed in a wide temperature range going from the melting point to near the critical temperature. In this way most of the common working conditions are addressed.