

Viscosity of Di-isodecylphthalate by Surface Light Scattering (SLS)

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Within the scope of the measurement of transport and other thermophysical properties of fluids, three years ago and for the first time – to the best of our knowledge – we presented the investigation of high viscosity fluids by surface light scattering (SLS), where, beside a silicone oil, di-isodecylphthalate (DIDP) was already of interest. The former investigations have demonstrated the applicability of the SLS-technique to fluids covering a wide range of viscosities from about 10 mPa·s to 1 Pa·s. Our renewed interest on DIDP was stimulated by recent research activities of the “International Association for Transport Properties (IATP)”, which suggested DIDP as a potential industrial standard of moderately high viscosity (100 mPa·s). For this purpose, however, measurements on the same material by different techniques were encouraged. The aim of further experimental investigations by SLS was to contribute to the verification and improvement of a recommendation for DIDP as an industrial reference fluid.

This paper summarizes all investigations of the viscosity of DIDP carried out within the last three years at LTT-Erlangen, in which four independent measurement series were performed by SLS for the same sample. DIDP with the same nominal purity was also investigated by different techniques in several laboratories throughout the world. Three measurement runs by SLS are devoted to the viscous behavior of DIDP in a temperature range between 273 and 313 K. Within a further experimental run for temperatures between 323 and 433 K, viscosity and surface tension could be determined simultaneously by SLS. For temperatures between 273 and 313 K, corresponding to a viscosity range of about 650 to 40 mPa·s, respectively, a total uncertainty of 1 % could be achieved for the viscosity of DIDP by carrying out an exact data evaluation procedure, whereby our own density data and reference data for the surface tension were used. The experimental results from SLS are discussed and compared to data from other techniques. The effect of the sample purity, especially with regard to its water content, is also pointed up here.