TRANSPORT PROPERTY MEASUREMENTS OF SUBCOOLED LIQUID PROPELLANTS

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Introduction

This research is focused on the measurements with high precision of thermal conductivity, viscosity and density of subcooled liquid para hydrogen and oxygen in the pressure and temperature ranges where no previous data exists. The obtained data will be used to verify and/or improve the existing correlations for these properties. Transport property correlations are needed for the successful design and operation of numerous engineering systems including the space launch vehicles.

Experimental

Thermal conductivity measurements are performed using a guarded, flat plate calorimeter. Density measurements are performed indirectly by measuring the dielectric coefficient of the cryogen and later relating it to its density through the Clausius-Mossotti relation. The viscosity is measured using a Rankine viscometer.

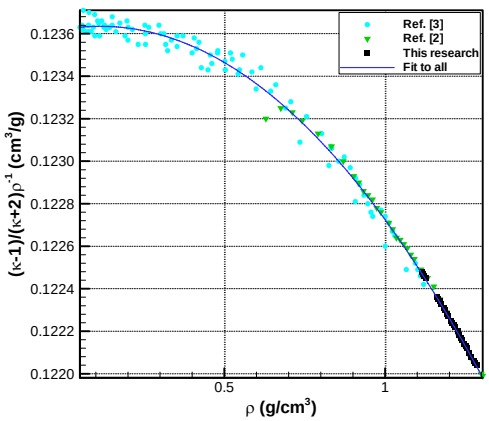

Fig. 1. Oxygen Clausius-Mossotti relation.

Results and Discussion

The Clausius-Mossotti relation vs. density of oxygen is given in Fig. 1. The existing data are used together with the results obtained in this research to construct a new correlation for the Clausius-Mossotti relation, see ref. [1] for details. The results of subcooled liquid oxygen thermal conductivity measurements are given in Fig. 2, see ref. [2] for details. Figure 3 shows the results obtained from liquid oxygen viscosity measurements.

Acknowledgements

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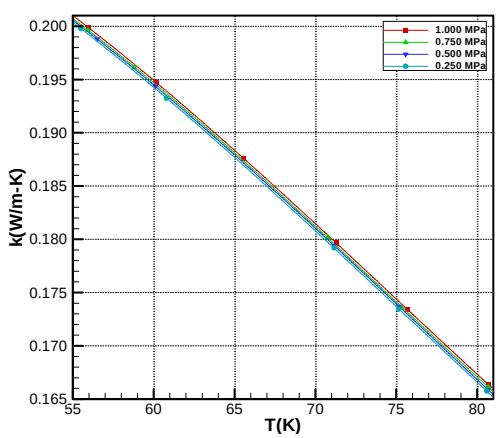

Fig. 2. Liquid oxygen thermal conductivity.

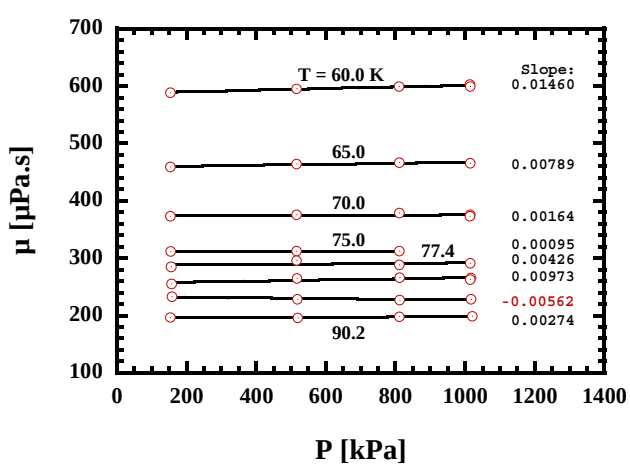

Fig. 3. Liquid oxygen viscosity measurement results.

References

[1] Celik, D., *et al.*, Cryogenics, **45**, 356-361 (2005).
[2] Celik, D., *et al.*, Cryogenics, **45**, 620-625 (2005).