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Title: Intercomparative tests on viscosity measurements of phase change materials

Authors: Mónica Delgado^{a,*}, Ana Lázaro^a, Michael Biedenbach^b, Sebastian Gamisch^b, Stefan Gschwander^b, Stephan Höhlein^c, Andreas König-Haagen^c, Dieter Brüggemann^c

^a Aragón Institute for Engineering Research (I3A), Thermal Engineering and Energy Systems Group, University of Zaragoza. Agustín Betancourt Building, C/María de Luna 3, 50018 Zaragoza, Spain. Phone: (+34) 876 555 584.

^b Fraunhofer Institute for Solar Energy Systems ISE, Heidenhofstraße 2, 79110 Freiburg, Germany

^c Chair of Engineering Thermodynamics and Transport Processes (LTTT), Center of Energy Technology (ZET), University of Bayreuth, Universitätsstraße 30, 95440 Bayreuth, Germany

*Corresponding author: monica@unizar.es

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Highlights

- Advances in intercomparative tests of viscosity of PCMs.
- Three different rheometers/institutions have been involved.
- Viscosity based on temperature of octadecane and RT70 has been determined.
- Results mainly influenced by the true sample temperature.

Abstract

Phase change materials (PCM) are capable of storing thermal energy within a small temperature range due to their high latent heat. When designing a thermal energy storage (TES) system with PCMs, besides the phase change enthalpy, thermal conductivity and density, viscosity based on temperature must be characterized to take into account natural convection. Taking advantage of the facilities of the different research groups working within an international network, a set of intercomparative tests were executed to determine the viscosity based on the temperature of two PCMs: octadecane and the commercial paraffin RT70 HC. Three laboratories have participated, which have used three different rheology equipments: two controlled stress rheometers, AR-G2 from TA Instruments and MCR 502 from Anton Paar and a translational rheometer, IMETER. The intercomparative tests were executed based on a starting methodology approach defined previously by some of the authors. The highest deviations were observed when temperature-controlled geometries or temperature hoods were not used at elevated test temperatures due to the temperature gradients within the sample, as consequence of the heat losses due to the room temperature. Consequently, special attention must be focused on the temperature control, since a uniform temperature throughout the sample should be guaranteed.

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