Intercomparison of Thermal Conductivity Measurements on PU Aerogels

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Due to their special combination of nanostructure and high porosity, aerogels are key materials for high performance thermal insulation materials. However, measuring reliable thermal conductivity values, which are essential for material's optimization and as product parameter is a challenging task in the case of aerogels. This was already stated in the report of the International Energy Agency, EBC Annex 65, for silica aerogel granules and fiber-reinforced composites. In this context, one complicating factor is the low thermal conductivity values of aerogels, e.g. below 0.02 $Wm^{-1}K^{-1}$ at ambient conditions, which is often outside of standardizations limits. Furthermore, due to the aerogel's huge specific surface areas and small pore structure, the thermal conductivity value is sensitive to the atmospheric pressure at 0.1 MPa and to potential humidity effects. Thus, experimentally derived thermal conductivity values are more or less influenced by the experimental set-up and the experimental conditions and have to be carefully discussed. Here we present results of a round robin test performed for a PU-aerogel (polyurethane) that is currently produced on a pilot scale as stiff panels. Prior to the intercomparison the material was checked for reproducibility in production and homogeneity. The dependence of thermal conductivity on air pressure and temperature was also determined. We discuss the results submitted by 11 participants with respect to the different experimental techniques applied and identify experimental parameters with severe impact on the resulting thermal conductivities.