Experimental Measurement of Thermophysical Properties of H_2O/KCOOH Desiccant

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The sorption dehumidification of air by desiccant is an interesting alternative to the traditional dehumidification process of cooling the air below the dew point. Desiccant includes liquid, such as hygroscopic salt or glycol solution, and solid, such as silica gel, zeolites or activated alumina. The hygroscopic salt solutions currently used as desiccant are H_2O/LiCl and H_2O/LiBr which ensure very effective dehumidification performance, although they are corrosive and very expensive. The new hygroscopic salt solution H_2O/KCOOH is cheap, non-corrosive, biodegradable, and it exhibits a very high solubility (up to 80% at ambient temperature) which ensures a consistent humidity reduction, therefore it seems to be very promising as "*desiccant of the future*". H_2O/KCOOH is currently used at low salt concentration as heat transfer medium and biodegradable de-icing solution and its thermophysical properties are available only for concentration in salt from 20 to 40%, not interesting for desiccant application. Therefore there is a specific need for a sound amount of new experimental data on thermophysical properties of H_2O/KCOOH solution in the typical concentration and temperature range for desiccant application.

The aim of this paper is to measure the thermal conductivity and the dynamic viscosity of H_2O/KCOOH solution with a concentration in salt from 60 to 80% in the temperature range from 0 to 80°C. The thermal conductivity measurement were performed by using a Transient Hot Disk TPS 2500S apparatus instrumented with the 7577 probe (2.001 mm in radius) having a maximum uncertainty (k= 2) within ± 5.0%. The rheological analysis and the dynamic viscosity measurement were carried out by a rotating disc type rheometer Haake Mars II instrumented with a double cones probe (60 mm in diameter) having a maximum uncertainty (k=2) within ± 5.0%. The experimental measurements were compared both with other experimental measurements available in the open literature and theoretical models for thermophysical properties of hygroscopic salt solutions.