**HEAT STORAGE OF CRYOGENIC FLUIDS OF OCEAN WORLDS.** V. Muñoz-Iglesias[1] and O. Prieto-Ballesteros[1], [1]Centro de Astrobiología (CSIC-INTA). Ctra. Ajalvir km. 4, 28850 Madrid, Spain. E-mail: vmunoz@cab.inta-csic.es, prietobo@cab.inta-csic.es.

**Introduction:** Chemical composition of the endogenic fluids of active planetary bodies changes according to location gradients at the solar system. Thus, there is a declining in silicates and salts and an enrichment in volatiles in systems farther of the Sun. Fluid thermal behavior is determined by this composition and the pressure-temperature (P-T) conditions from the interior to the surface. Specific heat (Cp) is an important property to be constrained since it is the measurement of the capacity of a system to store heat.

**Results:** In this experimental work we are measuring with the high pressure μDSC7 evo calorimeter (SETARAM Instrumentation, France) the variation on the specific heat at temperatures down to 230 K and pressures up to 500 bar of solutions with planetological interest for icy moons [1-5], as Europa, Titan, Enceladus and Triton. Eutectic compositions of aqueous solutions of $Na_2CO_3$, $NaHCO_3$, $MgCO_3$, $MgSO_4$ and NaCl, and aqueous solutions of 10-100wt% methanol (MeOH) and 10-30wt% ammonia ($NH_3$) have been already evaluated (Figure 1). The results are complemented with Raman spectroscopy to study the species responsible of the Cp values depending on the P-T conditions.

**Discussion:** Below eutectic point, Cp values of salty-rich solutions are lower respect to the liquid state. The higher the salt concentration allowed before getting the eutectic, the lower is the Cp of the resulted aqueous solution after melting.

Intriguing results have been obtained respect to the systems with MeOH and $NH_3$. With the rise in temperature, Cp increases gradually to high values until the liquidus curve. Raman signature shifts of the systems 20wt% MeOH (Figure 2) and 15wt% $NH_3$ are being analyzed with the aim to elucidate this strange behavior of the Cp and its relationship with the physico-chemical state of the system.

These results show how complex may be the estimation of the thermal evolution of planetary bodies with time. In the cases of icy moons richer in salts, it is expected higher heat retention in the liquid reservoirs than in the solid crust. However, the presence of volatiles can alter this trend, and revert the thermal behavior.

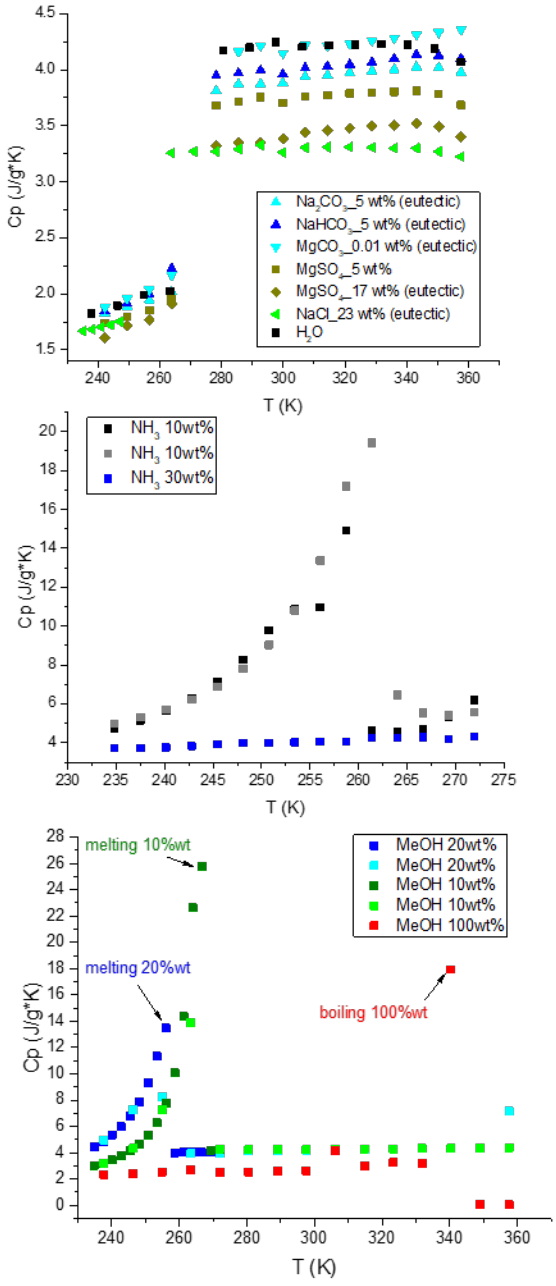


Figure 1. Cp values of aqueous solutions of salts, MeOH and $NH_3$ at temperatures down to 230 K at 1 bar.

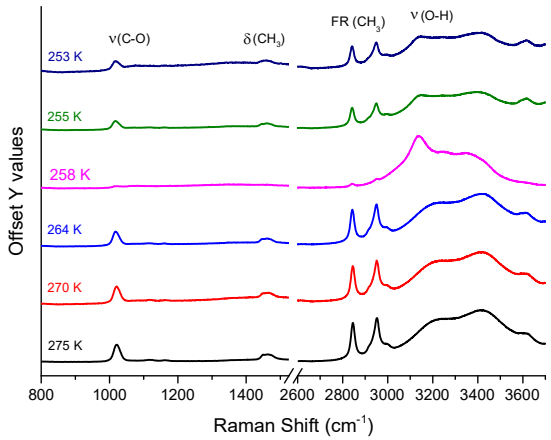


Figure 2. Raman spectra of an aqueous solution of 20wt% MeOH at temperatures from 253 to 275 K, at 1 bar, crossing the liquidus curve at 258 K. Main vibrational modes are indicated at the top, FR means fermi reso-nance.

**References:**

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