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Silica Hollow Nanoparticles Revealed by Synchrotron Radiation **Y.H. Tang** and **T.K. Sham*** <*tsham@uwo.ca*>, Department of Chemistry, Western University, London, ON N6A 5B7.

Silica hollow nanoparticles can be used as light weight reinforced materials compared to silica nanoparticles because it is core-free; thus it can be classified as a kind energy material. For the first time, silica hollow nanoparticles were studied by synchrotron radiation. In our synthesis, silica hollow nanoparticles were synthesized by sol-gel method. PAA (polyacrylic acid) was the template core and TEOS (tetraethyl orthosilicate) containing the silicon atom was the starting material. The silica hollow nanoparticles were formed after the template core was gradually etched by ethanol. High-resolution TEM shows that the average diameter of silica hollow nanoparticles is 60 nm and the thickness of the shell is 6 nm. With synchrotron radiation, Si L3,2 and L1 absorption edge, Si K edge and O K edge were measured. The spectra reveal silica hollow nanoparticles have obvious stronger L1 edge and K edge. An absorption explanation was proposed to understand the behavior of silica hollow nanoparticles at L1 edge and K edge.

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A Temperature-Controlled Cold Stage for Micro-X-Ray Diffraction of Sodium Sulphate Bearing Samples from the High Arctic **M.S. Bramble*** <*mbramble@uwo.ca*> and **J.L. Hutter**, Department of Physics and Astronomy; **R.L. Flemming**, Department of Earth Sciences, University of Western Ontario, London, ON N6A 5B7.

Studies of mineral precipitates from high Arctic saline springs returned samples which changed mechanical properties upon adjusting to ambient conditions. The minerals involved were believed to be hydrated forms of sodium sulphate (Na_2SO_4). Thenardite (the non-hydrated form) was identified via bulk XRD but, in order to analyse the samples in an *in situ* environment, a temperature-controlled (TC) stage was created for use with micro-X-ray diffraction (μXRD).

This study developed a TC sample stage that allows for μXRD of minerals within a range (-45 to 85°C) of temperatures (T). The stage consisted of 3 mm thick copper sample trays on top of a Peltier-effect module, itself placed atop a copper, water-cooled heat sink. A thermocouple inserted into the sample tray provided T measurements to the controller.

This stage was demonstrated via acquisition of *in situ* diffraction data for a synthetic sample of mirabilite ($Na_2SO_4 \cdot 10H_2O$) held at -25°C and incrementally warmed to ambient T. No phase changes were seen in the mirabilite during ~2 hours held at -25°C despite the μXRD enclosure being at ambient T and humidity. Beginning at 0°C and continuing until ambient T, the mirabilite dehydrated and was observed to undergo a phase transformation to thenardite.

After warming above 0°C, water entered the sample tray from the melting of condensation ice crystals. Further studies will address this as the water caused both minerals to crystallize as 5-15 μm crystals in the sample tray during the warming from 0 to 23°C. After reaching ambient conditions the mirabilite completely dehydrated and only polycrystalline thenardite remained.

This cold stage was designed for versatility and ease of X-ray access, with applications that extend to many geological and planetary settings, including cryogenic temperatures.