**WEATHERING OF ORDINARY CHONDRITES FROM THE ATACAMA DESERT, CHILE, BY SYNCHROTRON X-RAY DIFFRACTION AND MÖSSBAUER SPECTROSCOPY**. P. Munayco[1], R. R de Avillez[2], J. Brant de Campos[2], E. Dos Santos[1], M. Valenzuela[3] and R. B. Scorzelli[1]. [1]Centro Brasileiro de Pesquisas Físicas, RJ, Brazil. [2]DCMM, PUC/Rio, RJ, Brazil. [3]Universidad de Chile, Santiago, Chile.

The study of meteorites depends largely on finding samples that may have been under the influence of the environment for over hundred years. An interdisciplinary study is under way with meteorite samples from the Atacama Desert, one of the oldest and driest desert of the world, in an attempt to understand the weathering processes acting on these primitive materials and the conditions of the accumulation surfaces that have preserved them. Those samples may have undergone weathering processes that may result in large changes of their original phases. Oxidation is certainly the most important reaction to consider and their products are usually crystalline oxides associated to the iron matrix.

This paper reports the results obtained by synchrotron radiation x-ray diffraction (SR-XRD) and Mössbauer spectroscopy (MS) investigation on ordinary chondrites from different areas of the Atacama Desert, Chile. X-ray diffraction is a natural choice to study crystalline materials but some attention must be paid to the experimental setup. To avoid the fluorescence from iron, one needs to use a monochromator, or a wavelength that reduces the iron fluorescence. Further, the small amount of the weathered phases requires very large acquisition times with normal laboratory diffractometers. Finally, many iron related oxides show very large peak superposition that makes very difficult their separation.

The present research employs synchrotron light to enhance the intensity, to choose a wavelength that reduces iron fluorescence and to provide a very monochromatic x-ray. The SR-XRD was carried out at the *Brazilian Synchrotron Light Laboratory in* Campinas, Brazil. The D12A-XRD1 X-Ray Powder Diffraction beamline was used with wavelength 1.96888 Å and Bragg-Brentano geometry. The data was recorded using $2\theta$ range from 15° to 100° with the acquisition time determined by the total photon arriving at a calibration monitor. Rietveld refinement was done with the TOPAS-Academic software with the fundamental parameters approach. The pyroxene and olivine phases have the scattering factors for the sites with iron and magnesium calculated with mean compositions of these elements obtained from the microprobe. Preferred crystallographic orientation was partially accounted for with March-Dollase or Spherical Harmonics. Crystallites sizes were estimated with a lorentzian curve.

Mössbauer measurements had also been performed in those samples with the quantification of total iron content inside each iron phase. The comparison between Rietveld and Mössbauer phase quantification had been done with the necessary conversion of the percentage of phase to molar percentage of iron in the specified phase. This conversion was calculated using the iron occupancy factor of the appropriate sites for each crystalline phase system, the number of molecules inside the unit cell and total cell mass of each phase.