EVIDENCE BY MÖSSBAUER SPECTROSCOPY OF THE INTERGROWTH TETRATAENITE/ ANTITAENITE IN THE VACA MUERTA MESOSIDERITE. R. B. Scorzelli[1], D. G. Rancourt[2], A. Bustamante Dominguez[1,3], G. Poupeau[4], C. Canut de Bon[5] and M. E. Cisternas[6], [1]Centro Brasileiro de Pesquisas Físicas, Rua Xavier Sigaud, 150, 22290-180 Rio de Janeiro, Brazil, [2]Department of Physics, University of Ottawa, Canada, [3]On leave from Universidad Nacional Mayor de San Marcos, [4]Université Joseph Fourier, Grenoble, France,[5]Universidad de La Serena, Chile, [6]Universidad de Concepción, Chile.

Investigation of Fe-Ni alloys in meteorites using Mössbauer spectroscopy have shown the presence of two fcc phases: tetrataenite (high-moment ordered γ-FeNi) and a nickel-poor (~30% Ni) γ-FeNi, which is paramagnetic at room temperature. This phase is never seen alone but always in close microstructural association with tetrataenite. Recently, Rancourt and Scorzelli [1] reported this phase as a low-spin γ-FeNi phase (γ_{LS}) and proposed this potential new mineral to be called antitaenite (because of its antiferromagnetism). The intergrowth tetrataenite/antitaenite that is a common state in slowly cooled meteorites, is the dominant state in ataxites and octahedrites and is present in the metal particles of chondrites.

We report here the preliminary results obtained by Mössbauer spectroscopy in metallic Fe-Ni of the Vaca Muerta mesosiderite. The purpose of this investigation is to see if the tetrataenite/antitaenite intergrowth is also present in the mesosiderite group of stony-iron meteorites. As the degree or order of tetrataenite depends on the cooling rate of the meteorite, we want to verify if the hyperfine Mössbauer parameters typical of tetrataenite can reflect the unusual thermal history of this group.

The Mössbauer spectra of the Vaca Muerta mesosiderite were taken using as absorbers the metallic Fe-Ni part of the meteorite in untreated form. The Mössbauer spectrum at room temperature of the sample as found showed a superposition of three sub-spectra: a) a six-line spectrum with a clear quadrupole splitting corresponding to tetrataenite; b) a single central line due to the presence of the γ_{LS} phase (antitaenite); c) a symmetric six-line spectrum (i.e., without quadrupole splitting) due to kamacite.

It can be seen that even in the untreated sample, where kamacite is present in a significative relative proportion, it is possible to detect the presence of the intergrowth tetrataenite/antitaenite. It is interesting to note that the Mössbauer hyperfine parameters inndicate a very high degree of order of tetrataenite which is consistent with the reported very slow cooling rates at low temperatures (0.1°C/10^6 yr) for the Vaca Muerta mesosiderite [2].

Further studies in taenite fractions obtained after consecutive etchings of the sample are still in progress.

References: [1] Rancourt D. G. and Scorzelli R. B. (1995) *J. Magn. Magn. Mater., 150,* 30. [2] Powell Benjamin N. (1969) *GCA, 33,* 789.