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Recent microprobe and Mössbauer studies[1,2] have shown that the bulk of the Ni rich (average around 35%) ataxite Santa Catharina consists of the ordered alloy Fe-Ni 50-50 presenting the superstructure L-10 and an iron rich phase with about 70% Fe 30% Ni. This phase corresponds to the central line observed in the room temperature Mössbauer spectrum of thin slices of the Santa Catharina[1,2] and with taenite lamallae of the Cape York, Toluca and Cranburne octahedrites[3,4,5,6]. It has been attributed to a paramagnetic gamma-phase of the alloy.

On going from room to liquid helium temperatures the Mössbauer spectra exhibit some changes. However, the presence of the paramagnetic central line at 4.2K is surprising since the Fe-Ni alloys with less 33% Ni (invar region) become ferromagnetic at such low temperatures.

Such stability may arise from an intimate intergrowth of small crystals of the disordered gamma-phase with the superstructure domains[7]. This would be compatible with the broadning of the central line, observed at 4.2K with the Toluca lamellae. However, with slices of the Santa Catharina the linewidth of the central line remains unaltered at low temperatures. More recently it has been suggested that this stability could be due to the formation of an ordered Fe_3Ni superstructure[8].

We report here experiments which show that the martensitic transformation gamma phase $\longrightarrow$ alpha phase is induced by mechanical treatment of the meteorites.

The Mössbauer spectra of the Santa Catharina in powder form was found to be markedly different from that observed with the thin slices of the meteorite. On filling the meteorite the intensity of the central line decreases and it becomes practically absent in the spectra obtained with 400 mesh powder. A new magnetically splitted spectra with larger internal field ($\sim$330 kOe) without quadrupole interaction appears.

These changes manifest also in the X-ray spectra of the meteorite. The alpha phase is absent in the slices but it appears in the Debye Scherrer of the powder with strong intensity.

Other changes in the Mössbauer spectrum of the meteorite induced by the mechanical treatment are due to the decrease of the average size of the ordered phase domains, as previously described[1,2].

The formation of the alpha phase is clearly observed in Mössbauer scattering experiments. The back-scattering spectrum of a mechanically polished sample of Santa Catharina, in which a surface layer of polished material is always present, gives three components instead of two as observed in the transmission spectra (Table I)

Mössbauer Scattering Spectra of the Santa Catharina Meteorit

	L mms^{-1}	IS mms^{-1}	H kOe	ΔE_q mms^{-1}	Area %
Line 1 (paramagnetic)	.40	-.29	-	-	32.6
Line 2	.53	0	294	+0.17	40.6
Line 3	.51	-.20	329	0	26.8

In this spectrum the paramagnetic line 1 is less intense and new line 3 arises from the martensitic transformation of the disordered paramagnetic gamma phase to the alpha phase.

Similar changes were also observed by mechanical treatment of the lamellae of the Cape York meteorite which were previously investigated by Mössbauer and X-ray techniques[4].

Drastic changes in magnetic properties of artificial iron rich Fe-Ni alloys were observed by Mössbauer spectroscopy[9,10]. The martensitic transformation induced in these alloys by cold rolling changes the Mössbauer spectra in the same as those observed with the meteorites.

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