

MÖSSBAUER SPECTROSCOPY OF THE SNC METEORITE ZAGAMI.

D.P. Agerkvist and L. Vistisen, Niels Bohr Institute, Blegdamsvej 17, DK-2100 Copenhagen Ø, Denmark

We have performed Mössbauer spectroscopy on two different pieces of the meteorite Zagami belonging to the group of SNC meteorites. In one of the samples we found a substantial amount of olivine intergrown with one kind of pyroxene, and also another kind of pyroxene very similar to the pyroxene in the other sample we examined. Both samples showed less than 1 % of Fe^{3+} in the silicate phase.

The group of SNC meteorites called shergottites, to which Zagami belongs, are achondrites whose texture, mineralogy and composition resembles those of terrestrial diabases [1].

We have performed Mössbauer spectroscopy on various specimens from Zagami. The first sample we studied was obtained from British Museum (sample BM 1966, 54) and the second sample from the firm David New, Anacortes, Washington (sample DN). A small part of each sample was gently crushed to give material for the Mössbauer absorbers.

The figures 1a and 1b show Mössbauer spectra of whole rock absorbers, i.e. no separation of minerals, from the BM sample and the DN sample, respectively. Using a low-magnification optical microscope two different looking types of silicates were separated from the crushed material of the DN sample and used as Mössbauer absorbers. One of the separates was grey-green, intergrown grains, the other was clear green, larger single crystals. In Fig. 1c and 1d the Mössbauer spectra of the two different silicates from the DN sample are shown.

The two spectra in Fig. 1a and 1b are clearly different even though both are recorded on whole rock samples from Zagami. In Fig. 1a we see pyroxene only, but in Fig. 1b we see both olivine and pyroxene and a little amount of ilmenite (at about 0.7 and 1.4 mm/s). This is a surprising result that has been reported previously [2].

The spectrum of the clear green, single crystals from the DN sample in Fig. 1d consists of lines from pyroxene only. This pyroxene resembles the pyroxene from the BM sample (Fig. 1a) extremely well, the Mössbauer parameters are identically and the site distribution is almost the same. The spectrum of the grey-green, intergrowth in Fig. 1c consists of lines from both pyroxene and olivine. The amount of Fe from olivine compared to Fe from pyroxene is 60:40. The pyroxene has the same Mössbauer parameters as the clear green, single crystals, but another site distribution. Our conclusion is that in the DN sample of Zagami we find two sorts of pyroxene, one very similar to the pyroxene in the BM sample of Zagami and the other differing and being intergrown with olivine.

Fe^{3+} in silicates has two lines, lying at about 0.1 and 0.7 mm/s. The line at 0.1 mm/s will be hidden in the pyroxene lines, but the line at 0.7 mm/s should be seen clearly. From this we can say that all the spectra of Zagami show less than 1 % of Fe^{3+} in the silicates. This is slightly less than has been reported for the SNC meteorite Nakhla [3]

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and much less than normally is seen in terrestrial silicates. Anyhow, the presence of titanomagnetite in both Zagami and Nakhla (even though very different [4]) shows that the SNC meteorites are more oxidized than the basaltic achondrites.

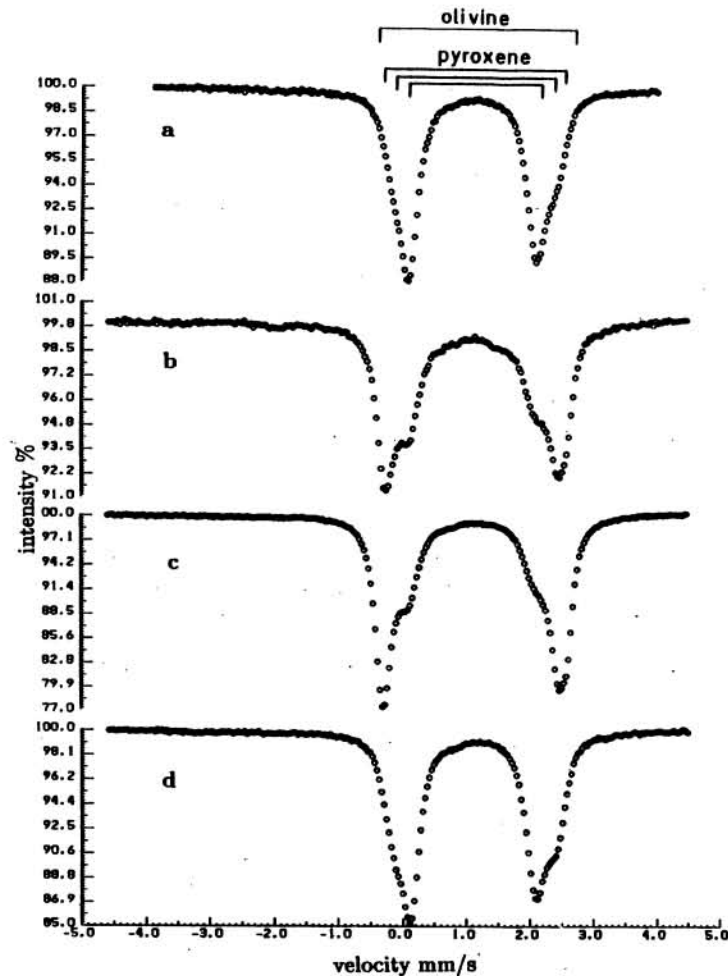


Figure 1: Room temperature Mössbauer spectra of Zagami a: BM sample, b: DN sample, c: intergrowth of pyroxene and olivine from DN sample, d: pyroxene from DN sample.

References

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