NEW RAMAN SPECTROSCOPIC DATA OF ALMAHATA SITTA METEORITE

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Introduction: 2008 TC_3 was the first meteorite previously observed in space and discovered afterwards. 2008 TC_3 fall took place on 7 October 2008 in the Nubian Desert (Northern Sudan). Its mass was around 3.95 kg.
All specimen, belonging to this fall, were called Almahata Sitta (AS), and could be classified as a multicomponent breccia composing of different meteoritic lithologies like anomalous polymict ureilites and different chondrites [1-3]. Therefore, the meteorite revealed to be of a rare type of extraterrestrial material, with also large amounts of carbonaceous grains.

Raman research: The investigation of minerals by Raman spectroscopy is an suitable methode to typify minerals within these planetary material. Raman measurements could be used to classify the structure and composition of quartz, pyroxenes, olivines and other materials within meteorites. In combination with electron microprobe, Raman spectroscopy is an excellent tool to typify different polytypes and polymorphs. Therefore it is for example possible to distinguish between graphite, graphene and diamond within the investigated AS samples.
Furthermore we could map areas of 90 µm to 90 µm to determin mineral phases within rather inhomogenous clusters in AS. The following **minerals** could be classified within our AS samples due to Raman measurements:

Graphite (see Figure 1)
Diamond
Graphene
Suessite (see Figure 2)
Schreibersite
Cohenite
Kamacites
Troilite/Cr troilite
Pyroxene
Plagioklas

Results: By means of our Raman measurements it was possible to characterize graphite, graphene and also diamond. To some extend, these three minerals occur in clusters within one sample. Especially graphene and graphite change within diminutive areas.
Moreover it was possible to acquire the first suessite Raman data. Up to now no exact Raman spectra of suessite was existing.
In addition we mapped areas, i.e. clusters and mineral inclusions within AS, where the local chemical composition as well as the mineral content vary within short distance.

Conclusion: Micro-Raman spectroscopy proved to be a quick and valuable tool for investigation of extraterrestrial material. No special sample treatment is needed, with the exception of polished surface. Therefore it is a good methode to characterize different minerals and polytypes within one sample and to make preliminary work for later microprobe measurements.

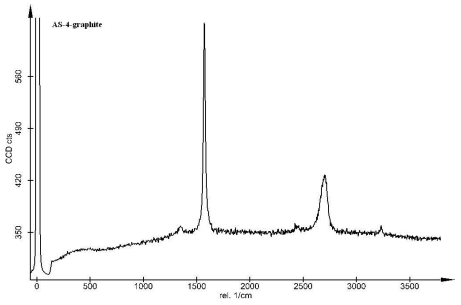

Figure 1: Graphite

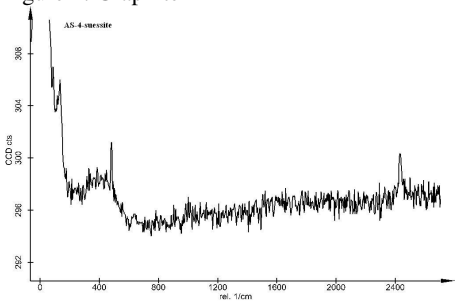

Figure 2: Suessite

References:

[1] Jenniskens P. et al. (2009), *Nature , 458:* 485-488. [2] Bischoff A. et al. (2010), *MAPS, in press.* [3] Hochleitner R. et al. (2004), *Journal of Raman spectroscopy, 35,* 515-518

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