MITT.ÖSTERR.MINER.GES. 149 (2004)

ASTEROMINERALOGY OF CIRCUMSTELLAR OXIDE DUST

Posch, T.[1], Hodouš, I.[1], Kerschbaum, F.[1], Richter, H.[1] & Mutschke, H.[2]

[1] Institut für Astronomie, Türkenschanzstraße 17, A-1180 Wien, Austria
[2] Astrophysikalisches Institut, Schillergäßchen 2-3, D-07745 Jena, Germany
e-mail: posch@astro.univie.ac.at

Within asteromineralogy – the research field dealing with the mineralogical composition of solids in space – substantial progress has been achieved during the past few years by *spectroscopic* and *microanalytic* methods (see, e.g., HENNING, 2003). In the infrared spectra of circumstellar shells and other dust-forming environments, several emission and absorption bands produced by sub-micron-sized dust particles could be identified.

While substantial efforts have been taken to detect the signatures of silicates (such as olivine), carbon and carbon compounds (such as diamond and silicon carbide) in the infrared spectra of astronomical objects, *oxides* have been more or less neglected as potential components of cosmic dust. No systematic investigation of these solids, combining astronomical and mineralogical information, has been carried out. The present contribution tries to fill this gap.

As first shown by POSCH et al. (1999), spinels can be detected in the IR spectra of circumstellar shells of red giant stars. It is noteworthy that terrestrial spinels, unless exposed to temperatures in the order of 1000 K, have different IR properties than their cosmic counterparts. By annealing experiments and subsequent FTIR spectroscopy, FABIAN et al. (2001) have been able to reproduce the emission features of the latter. We will deliver further evidence for this feature carrier identification.

Furthermore, Mg-Fe-oxides with stoichiometries close to that of wustite are shown to be the carriers of a strong, comparatively broad emission feature located at 19.4-19.6 μm, which is observed in the spectra of red giant stars as well (POSCH et al., 2002, 2004). This mineral species is also characterized by a temperature-dependence of its IR spectra, especially at low temperatures (~100 K), at which the widths of the main band decreases. We show that there are both cold and warm cosmic environments in which magnesiowustites are able to form and survive. Other potential components of circumstellar dust are titanium oxides (POSCH et al., 2003), but for their formation, no spectroscopic evidence is available as yet.

References

FABIAN, D., POSCH, T., MUTSCHKE, H., KERSCHBAUM, F. & DORSCHNER, J. (2001): Astron. Astrophys., **373**: 1125-1138.

HENNING, T. (2003): Astromineralogy. Springer, Berlin. 281 p.

POSCH, T., KERSCHBAUM, F., FABIAN, D., MUTSCHKE, H., DORSCHNER, J., TAMANAI, A. & HENNING, T. (2003): Astrophys. J. Suppl., **149**: 437-445.

POSCH, T., KERSCHBAUM, F., MUTSCHKE, H., DORSCHNER, J. & JÄGER, C. (2002): Astron. Astrophys., **393**: L7-10.

POSCH, T., KERSCHBAUM, F., MUTSCHKE, H., FABIAN, D., DORSCHNER, J. & HRON, J. (1999): Astron. Astrophys., **352**: 609-618.

POSCH, T., MUTSCHKE, H. & ANDERSEN, A. (2004): Astrophys. J., submitted.