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Optical constants of presolar diamonds (revisited)

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Presolar nano-diamonds isolated from primitive meteorites are one of the possibilities to study cosmic material directly in the laboratory.

Various mechanisms have been proposed to account for the production of diamond grains in space, but the most likely scenario seem to be that the presolar nano-diamonds have condensed directly from stellar outflows (Lewis et al. 1987; Jørgensen 1988; Clayton 1989; Daulton et al. 1996).

In order to model these outflows it is important to know the absorption and scattering cross sections of the nano-diamonds. These data have so far only been available in limited spectral ranges. Lewis et al. (1989) made the attempt to combine measured infrared data with modified literature data of bulk diamonds in the ultraviolet. Ultraviolet data for persolar diamonds have been measured by Mutschke et al. (1996), Andersen et al. (1998), and Braatz et al. (2000), but only in a very restricted wavelength interval.

We have performed an extended spectroscopic study of nano-diamonds from the Allende meteorite to close the gaps in the data. Different spectrometers and different preparational techniques have been used to obtain absorption spectra from the Vacuum Ultraviolet (0.12 ?m) to Near Infrared (3 ?m) wavelengths. These data have been combined
with already present infrared data to produce a consistent absorption spectrum which allows the derivation of the optical constants of the material by fitting with Lorentzian oscillators. Electron energy loss spectroscopy results are used to continue the data to even shorter wavelengths.

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