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Dust Changes in Sakurai's Object: PAHs, SiC and carbonates (not melilites)

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Sakurai's Object (V4334 Sgr) is a low mass post-AGB star that has been forming dust in an eruptive event since 1996. We have been analysing 6-14 μm Spitzer spectra obtained at 6 epochs between 2005 April and 2008 October to determine temporal changes in the dust features. An initially rapid mid-infrared flux decrease stalled after 2008 April 21. Optically thin emission due to nanometre-sized SiC grains reached a minimum in 2007 October, increased rapidly between 2008 April 21-30 and more slowly to 2008 October. 6.3-μm absorption due to PAHs with an underlying broad component increased throughout the observing period. The broad component was initially assigned to melilite silicates (Bowey 2021). However Bowey & Hofmeister (2022) reassigned the broad component to carbonate because the original laboratory data for melilites were dominated by a very low (<0.1 % by mass) component of carbonate in the sample which was undetected at other wavelengths. Mass estimates based on the optically thick emission (Evans 2020) agree with those in the absorption features if the large SiC grains formed before 1999 May and PAHs formed in 1999 April-June. Some of the submicron-sized silicates responsible for a weak 10 μm absorption feature are probably located in Sakurai's local environment because its optical depth decreased between 2007 October and 2008 October. With magnesite ($MgCO_3$), the abundance of 20-micron-sized SiC grains is increased by 10 - 50 per cent and well-constrained. The mass of carbonate dust is similar to the mass of PAH dust. Experimental work on carbonate formation is required because a similarly broad 6.9-μm absorption feature is common in molecular clouds and YSOs.

Session

Dust and presolar grains

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