DUST PROPERTIES OF COMET 73P/SCHWASSMANN-WACHMANN 3 FRAGMENTS B and C. David E. Harker1, Michael L. Sitko2, Charles E. Woodward3, Diane H. Wooden4, Ray W. Russell5, David K. Lynch5
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Introduction: In 1995, comet 73P/Schwassmann-Wachmann 3 broke apart into several (~66) fragments. Observations of two of the largest surviving fragments, [B] and [C], during the 2006 apparition provided an unique opportunity to observe potentially pristine material released from beneath the processed surface layer of a short-period, Jupiter-family comet. We present mid-infrared 11.7 and 18.5μm narrowband images and analysis of 10/20μm spectra derived from thermal grain models [1,2] obtained on Gemini-N (+Michelle) of fragments SW3-[B] and -[C].

SW3-[B]: Observations of this fragment occurred ≈27.5 days after a significant outburst event (2 April 2006 UT); the 11.7 and 18.5μm images revealed a tail of material extending > 16" from the nucleus in the anti-sunward direction at p.a. = 20.5° (Fig. 1a). The coma appears "detached" from the nucleus with a maximum in the surface brightness 3" from the peak nuclear isophote. A silicate emission feature, arising from grains < 1µm in radius, is observed in the 10μm region, both on (feature-to-continuum ratio at 10.5μm ≈1.15) and offset 3" to the southwest (feature-to-continuum ratio at 10.5μm ≈1.25) from the nuclear condensation. Weak emission arising from crystalline silicates (e.g., 11.2μm feature) was evident in the spectra of [B], and the observed SEDs can be modeled by an admixture of amorphous olivine, pyroxene, carbonaceous, and Mg-rich crystalline olivine grains (Fig 2a). By mass fraction, amorphous olives are the dominate contributor to the SED throughout the coma; crystalline olivine mass fraction peaks ~4" from the nucleus, and the n(a)da peak is the smallest (~0.7μm) 2" from the nucleus in the anti-sunward direction. Most of the amorphous grains in the coma of [B] are moderately porous, except at 2" where they are solid. Spectra from 17-23μm are featureless in both the central and offset positions.

SW3-[C]: The coma of [C] was more condensed than that of [B], with a dust tail extension at p.a. = 225°(Fig. 1b). Spectra of fragment [C] show emission from the olivine materials as well as emission from amorphous pyroxene (Fig. 2b). In [C], the n(a)da peak is constant (~0.5μm) throughout the coma. The amorphous grains throughout the coma of [C] are of the same moderate porosity seen in most of the coma of [B].


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Figure 1: 73P Gemini (+Michelle) 11.7μm images (a) Fragment [B]; (b) Fragment [C]. The sunward direction is also indicated.

Figure 2: The 10 and 20μm spectra of: (a) [B]; (b) [C] centered on the nucleus (open circles with error bars), and the spectra model decomposition: total SED (red), amorphous olivine (light blue), amorphous pyroxene (dark blue), amorphous carbon (orange), and Mg-rich crystalline olivine (green).