MINERALOGY OF PARTICLES FROM TWO STARDUST TRACKS: COMPARISONS WITH OTHER PARTICLES FROM THE SAME TRACKS

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The successful analysis of comet 81P/Wild 2 particles returned by the Stardust mission has revealed that the Wild 2 dust contains abundant silicate grains that are much larger than interstellar grains and appear to have formed in the inner regions of the solar nebula [1]. The shape of tracks and the presence of individual components dispersed along the tracks indicate that Wild 2 dust consisted of loose aggregates [2], or large mineral grains that fragmented along the tracks [3]. Here we describe the mineralogy of five particles extracted from two Stardust tracks and compare our results with other particles from the same tracks [4-6].

We have examined mineralogy of five Wild 2 samples using Hitachi-S4500 FE-SEM at University of Tokyo. These grains originate from four terminal particles from two tracks C2067 and C2081. They are TEM ultramicrotomed sections prepared at JSC. We examined: four grids from the grain C2067,1,111; five grids from C2067,1,111,2; five grids from C2067,1,111,3; four grids from C2067,1,111,4; four grids from C2081,1,108,5; and four grids from C2081,1,108,6.

C2081,1,108,5 is a terminal particle containing a large (~30 μm) polycrystalline grain composed of elongate fibers <0.2 μm in width. The fibrous texture of this grain is unusual among the Stardust samples. EDS analysis shows that it contains only Si, O and small amount of Cl. It is likely a contaminant. We also examined three grids (#3,4,5) from *C2081,1,108,6*. No crystalline phase was found; only fragmented grains of Si-rich aerogel were observed. Crystalline silicates, including chondrule-like objects, were identified in a different terminal particle from this track by Nakamura et al. [4,5], but were not observed in our sample.

In *C2067,1,111,1 and C2067,1,111,3*, no crystalline grains were observed. *C2067,1,111,2* is 15 μm in size, mainly composed of Si-aerogel with submicron-sized Fe sulfide grains. Fe-bearing olivine grains are present, but rare. *C2067,1,111,4* is dominated by fragmented olivine crystals up to 10×10 μm in size. This particle is observed in all three consecutive grids. It is composed of Fe-rich olivine, and an Al-Fe-bearing phase (possibly pyroxene?). These grains are surrounded by compressed aerogel. The olivines exhibit a minor, but distinctive heterogeneity in their compositions, ranging from $Fo_{67\text{-}73}$. Similar heterogeneity is also observed by [7]. The olivine compositions in this study are within the range of other Wild 2 olivine compositions [8], but more Fe-rich than most of the Wild 2 olivine. The olivine composition in this study is in good agreement with the synchrotron X-ray diffraction studies of the same grain by [6].

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