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Are Pyroxenes Necessary for the 9.3 Micron Thermal Emission Feature of Cometary Dust?

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Spectroscopic infrared observations of thermal emission from dust in a variety of environments have revealed sharp peaks originating from crystalline silicate components of the dust. The silicate features are commonly attributed to forsterite, which is the end-member of magnesium-rich olivines. However, recent discoveries of a peak at a wavelength of 9.3 micron in cometary comae shed light on the presence of magnesium-rich pyroxene grains. We reconsider the origin of the observed mid-infrared features based on our model of interstellar dust: Primordial interstellar dust is assumed to be an aggregate consisting of submicron grains that have an organic refractory mantle and an amorphous silicate core. Our modeling includes the possibility that amorphous silicates are partially crystallized by heat due to explosive reactions of radicals in the organic refractory when the dust is heated up above a few hudred kelvins. We find that our dust models reproduce all the observed mid-infrared emission peaks without invoking the presence of pyroxenes. We will present our models of fractal dust aggregates along with the results of the infrared emission from the aggregates.