High-Albedo C-Complex Asteroids In The Outer Main Belt: The Near Infrared Spectra

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Outer main-belt asteroids are generally icy and primitive (C-complex, primary) with low geometric albedos (0.05). However, high-albedo C-complex asteroids were identified by recent observations with AKARI (Usui et al. 2011). The findings offer scientific motivation for the presence of unusual minerals in the objects or, possibly, surface water ice. We carried out near-infrared spectroscopic observations (1.1–2.5 μm) using the Subaru-IRCS for the asteroids with high-albedos (≥ 0.1).

Kasuga et al. (2013) found no absorption features characteristic of water ice (near 1.5 and 2.0 μm) in the objects. Instead, the intimate mixtures models found Mg-rich amorphous silicates. As for asteroid (1576) Fabiola, orthopyroxene (crystalline silicate) is also attainable (Figs. 1 & 2). Consequently, the moderate Mg-rich amorphous or crystalline silicates are likely to cause the high-albedos [1].

The orthopyroxene is unlikely to be formed in the C-complex asteroids (Kunihiro et al. 2004). Here, as examples, we take the presence of the high temperature components (e.g. crystalline silicates (Mg-rich), chondrules, CAIs) in comets (e.g. Wooden et al. 2008). Nakamura et al. (2008) focuses on the oxygen isotope compositions in comet 81 P/Wild-2 which correspond to those of chondrules in carbonaceous chondrites, suggesting a link between comets and outer main-belt objects. Following the sense, high temperature components may be common in outer main-belt asteroids. These inclusions in meteorite surfaces are known to increase albedo (Kamei & Nakamura 2002).

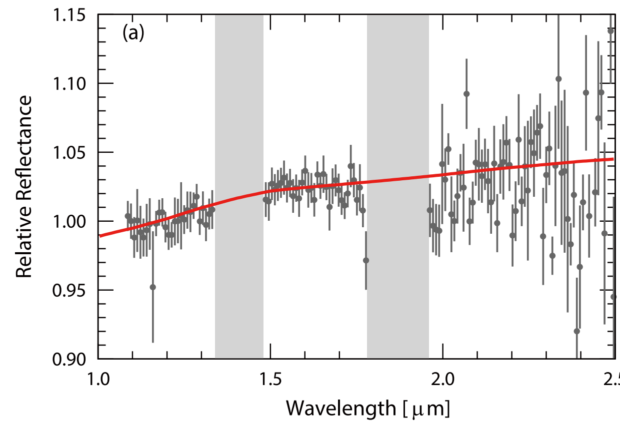

Figure 1: Panel (a) shows reflection spectrum of (1576) Fabiola (black) and the model (red) using 0% water ice, 61% amorphous carbon, and 39% amorphous pyroxene (with 80% Mg) by weight and grain size 6 μm ($\chi^2 \sim 1.49$).

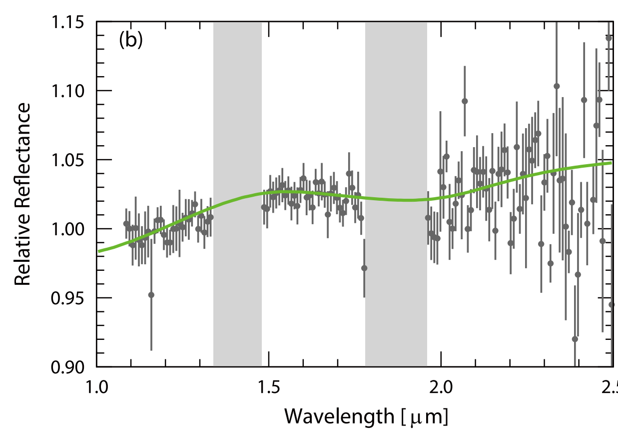

Figure 2: Panel (b) is fitted by the model (green) 0% water ice, 54% amorphous carbon, and 46% orthopyroxene by weight and grain size 3 μm ($\chi^2 \sim 1.28$).

Reference

[1] Kasuga, T., et al.: 2013, *AJ*, **146**, 1.