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Two new basaltic objects in the Outer Main Belt

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The existence of basalt on the surface of asteroids provides information about their thermal history that is likely related to their formation and collisional evolution. Basaltic materials on the surface of an asteroid are indicators of past partial melting, a phenomenon that occurs due to the complicated interplay of heating and cooling processes within the interior of rocky bodies. Until recently, most of the known basaltic asteroids, taxonomically classified as V-type, were members of the Vesta dynamical family. Currently, several V-type asteroids are know to reside outside the Vesta family (e.g. [3][8]), and several NEAs with basaltic mineralogical surface composition have been recognized (e.g. [5] [1][6]). The asteroid (1459) Magnya, a basaltic object in the outer asteroid belt [10], is sufficiently distant from the Vesta family so that its probability of origin from this family is very low [11]. [12] presented the possibility of searching yet unknown V-type asteroids using photometric data from the Sloan Digital Sky Survey (SDSS). A sub-product of this survey is the Moving Objects Catalog (MOC), which in its third release provides five band photometry for 43424 asteroids [7][9]. [12] introduced a systematic method to identify possible candidate V-type asteroids from the SDSS-MOC, applying the Principal Components Analysis to the data. They found 263 V-type candidates that are not members of the Vesta dynamical family. The most interesting result is the presence of 8 V-type candidates in the middle/outer asteroid belt, i.e. with a $>$ 2.5 AU: (7472), (10537), (21238), (40521), (44496), (55613), (66905) and (105041). These asteroids are quite isolated in proper elements space and do not belong to any of the major dynamical families. They are not close in proper elements space to (1459) Magnya either. In a recent study, [2] analyzed the spectra of (21238) in the near infrared (NIR) and confirmed its basaltic nature. In this work

we present low resolution spectra in the visible range of (7472) Kumakiri and (10537) 1991 RY16 have been obtained by us on November 14th, 2006, using the Calar Alto Faint Object Spectrograph (CAFOS) at the 2.2m telescope in Calar Alto Observatory, Spain. The reflectance spectra of the two bodies seem to correspond to that of a V-type asteroid. However, the presence of a shallow absorption band around 0.6 microns, which has never been observed before in other V-type spectra, precludes these objects from being classified by any existing taxonomic system [4]. It is worth noting that the observed band is real and its presence in the spectrum of (10537) has been confirmed independently by other observers [13]. Therefore, we do not know whether we have discovered two basaltic asteroids with a very particular and previously unseen mineralogical composition or two objects of non basaltic nature that have to be included in a totally new taxonomic class. To unambiguously determine whether our targets have basaltic surfaces, we will observe in the near-infrared range.

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