CHARACTERIZING THE STRUCTURE OF DIAGENETICALLY PHOSPHATIZED K/PG IMPACT SPHERULES FROM EDELMAN FOSSIL PARK, MANTUA TOWNSHIP, NEW JERSEY. P. V. Ullmann[1] and R. D. Ash[2], [1]Department of Geology, Rowan University, Glassboro NJ 08028, ullmann@rowan.edu, [2]Department of Geology, University of Maryland, College Park MD 20742, rdash@umd.edu.

Due to the instability of glass, impact spherules in the geologic record are commonly encountered to be diagenetically altered to secondary mineral phases [1-2]. Early diagenetic geochemical regimes control both the preservation potential of original glass and the mineralogy of secondary replacement phases [3]. To date, impact spherules have been found to be altered to a diverse suite of minerals, including clays [2, 4-6], calcite [3], pyrite, magnetite [6], iron hydroxide [7-8], hematite [8], potassium feldspars [6], and the aluminous hydroxyl phosphate goyazite [2].

We report the first occurrence of diagenetic phosphatization of impact spherules, which were recently recovered from K/Pg boundary deposits at the Jean and Ric Edelman Fossil Park at Rowan University in Mantua Township, New Jersey. At this site, glass spherules were deposited in a productive, organic-rich, shallow marine environment, now represented by heavily bioturbated glauconitic greensands of the Hornerstown Formation [9]. These specimens were discovered as a single, fluorapatite-cemented aggregate (of volume roughly 2 cm^3), which we infer to reflect passive depositional accumulation within a *Thalassinoides* burrow (as at Agost, Spain [7]). Specifically, we hypothesize that sufficient levels of dysoxia for spherule phosphatization to occur may have only been reached within rare, confined pockets of *Thalassinoides* burrows, and that such microenvironments thus became conducive to spherule preservation via early diagenetic phosphatization. Such spatial limitation on spherule phosphatization potential would explain lack of recovery of isolated spherules from the surrounding sediments, as well as their cementation by fluorapatite into an aggregate.

We have examined the spherules through x ray diffraction (XRD), scanning electron microscopy, and petrography. XRD revealed the spherules to be composed of fluorapatite, matching the composition of coprolites, bones, and invertebrate steinkerns also analyzed from the surrounding sediments. Most of the spherules exhibit modest diagenetic compaction, yet projectile teardrop shapes (Figure 1) and accretional forms are present. Alike spherules that have undergone alteration to smectite [2-3], these specimens are hollow due to hydrolysis/dissolution of glass cores; no original glass fragments were encountered. Spherule walls are generally homogenous without concentric laminae. The external surface of each spherule is finely mammillated (Figure 1), and similar rounded structures coat exposed surfaces of minute concentric cracks within the walls of the spherules; very similar mammillated textures have been described in phosphatized volcanic glass [10]. The internal surface of each spherule is coated by a thin, white layer of rounded, submicron fluorapatite crystals. Trace element analyses are currently underway to identify chemical changes associated with phosphate replacement of the original glass in these specimens.

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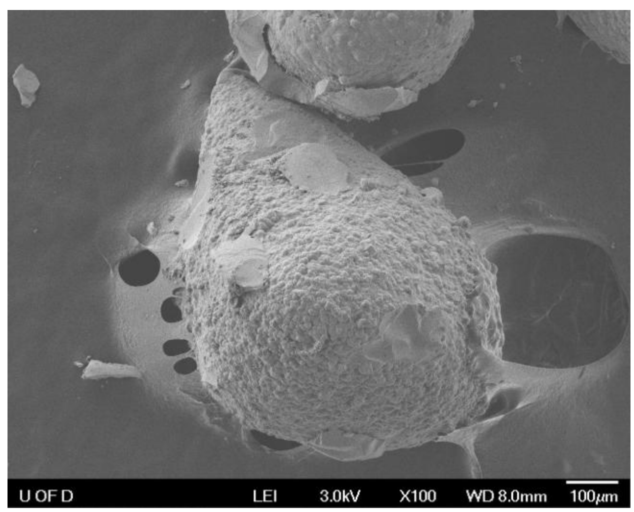

Figure 1. Field emission scanning electron microscope image of a phosphatized teardrop-shaped K/Pg impact spherule recovered from the Hornerstown Formation at Edelman Fossil Park, Mantua Township, New Jersey. Note the finely mammillated external surface texture and conchoidally-fractured fragments of adjoined spherules that were broken away from the imaged specimen.