

**Nanoscale investigation of volatile-rich phases
associated with alteration of Fe,Ni metal in the
Apollo 16 sample 66095 “Rusty Rock”**

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The Apollo 16 sample 66095 “Rusty Rock” is the most volatile-rich sample returned from the Moon, associated with an ancient lunar fumarole [1]. 66095 is an impact-melt breccia with abundant chlorides, sulfides, and phosphates, as well as chloride-containing iron oxyhydroxides (the ‘rust’). The origin of the rust in 66095 has been long debated (i.e., lunar or extra-lunar processes). A subsample of 66095 was examined by TEM after ~5 months of terrestrial atmosphere exposure, having previously remained sealed in pristine N₂ atmosphere since its return from the Moon. TEM work in three FIB sections targeting the ‘rust’ reveals the presence of stanfieldite, a rare Ca,Mg phosphate that evidence indicates it formed on the Moon by an alteration event. Akageneite is also found and our observations, together with the literature, suggest it may be terrestrial. This work highlights the importance of nanoscale investigation of these valuable samples to understand their origin and petrogenetic histories. This work is supported by the CASA Moon NASA SSERVI node.

[1] Shearer et al. (2014) GCA 139, 411–433.