

American Mineralogist, Volume 107, pages 153–155, 2022

LETTER

On the formation of Martian blueberries

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ABSTRACT

The Martian blueberries, first discovered by NASA's Opportunity rover, are concretions likely formed in sediments from hydrothermal solutions resulting from bolide impact into groundwater or permafrost. Evidence for this conclusion comes from the shapes of particle size distributions measured from Opportunity photos by Royer et al. (2006, 2008). These distributions, which exhibit a unique negative skew and lognormal positive skews, fit theoretical and experimental shapes determined for minerals precipitated from solution at higher and lower levels of supersaturation, respectively. The authors of these particle size measurements suggested that the blueberries were formed by aggregation or vapor condensation from a large meteoritic impact cloud. This origin is unlikely because such an event would not have created both negative and positive skews that closely fit distribution shapes expected for mineral crystallization from solution.

Keywords: Martian blueberries, crystal growth, Ostwald ripening, Mars, concretions