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Two-Stage Evolution of Lunar Granulite 79215 as Revealed by Zircon and Phosphate Dating

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Lunar granulitic breccias likely formed by prolonged heating and burial of ancient impact ejecta by younger hot impact ejecta. Multiple chronometers can be applied to reconstruct their detailed history. Previous data on Apollo 17 granulitic impactite 79215 yielded Ar-Ar ages ranging from 3.9 to 4.0 Ga. We identified zircons (Zi) commonly smaller than 6 μm in width of which many are skeletal and poikilitically enclose other minerals, indicating *in situ* growth. Because Zi often occur in the granulitic matrix and in clast remnants also containing FeNi, the small Zi grains likely grew from impact melt or by impact-related heating and recrystallization. *In-situ* dating of 16 Zi grains yielded U-Pb ages that scatter on the concordia between 3.9 and 4.3 Ga. In contrast, U-Pb ages for Ph are commonly concordant and range from 3.8 to 4.0 Ga (n=37). The textures and association of FeNi with Zi imply that Zi records a major impact event at ≥4.2 Ga, followed by partial or complete resetting of Zi and Ph at ~3.9 Ga, presumably related to heating by Imbrium-derived ejecta.

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