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TEM Analyses of Novel Lunar Zircon Shock Microstructures

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The mineral zircon develops a range of textural evidence of impact shock modification depending on the pressures and temperatures experienced during the impact cratering event [e.g. 1, 2, 3]. In particular, the formation of shock microtwins and the high pressure polymorph of zircon, reidite, are considered indicative of modification in an impact environment [e.g. 4, 5, 6]. We recently identified a novel morphology (spherical shell) of shock microtwins in a zircon from Apollo 14305 that are not easily explained based on previously described deformation structures [7]. We have undertaken TEM analyses to further investigate the characteristics of the especially complex and seemingly novel microstructures in this zircon in order to better understand their formation and assess possible effects of these features on U-Pb analyses. Preliminary results confirm extensive twinning and crosscutting planar features that offset the twin lamellae. One of the planar features contains melt inclusions and recrystallized zircon that offsets the other planar feature, possibly suggesting two deformation events during one or more shock loading and unloading cycles on the Moon.

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