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Melt-mediated re-equilibration of zircon produced during meltdown of the Chernobyl reactor

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Abstract

The mineral zircon is used widely to constrain the age of rocks and the processes that formed them. Although zircon is robust to a range of physical and chemical processes, it may show evidence for rapid re-equilibration that is generally considered to reflect interaction with hydrous fluids. Here, we show that zircon grains that crystallized from melt produced during the catastrophic meltdown of the Chernobyl nuclear reactor exhibit re-equilibration textures that occurred in an environment without free water. The process of re-equilibration involved a melt-mediated interface-coupled dissolution-reprecipitation that took place over a few days to produce textures that are commonly observed in igneous and anatectic systems. Thus, the composition of zircon can be modified even in the absence of hydrous fluids in a short time frame. Through this process, zircon crystals may track the timing of the last silicate melt they interacted with.

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