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Reidite: An impact-produced high-pressure polymorph of zircon found in marine sediments

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ABSTRACT

Reidite is a high-pressure polymorph of zircon with the scheelite structure. It has been found in an upper Eocene impact ejecta layer in marine sediments on the upper continental slope off New Jersey and on Barbados. Reidite occurs (epitaxially oriented) in shock-metamorphosed zircons. It is associated with impact glass (tektites), shocked quartz and feldspar with multiple sets of planar deformation features, coesite, and trace amounts of stishovite. This phase was first produced in high-pressure laboratory experiments in 1969 and has also been produced in shock recovery experiments. Reidite is brittle with an irregular fracture, a hardness of 7.5, a calculated density of 5.2 g/cm^3, a white streak, adamantine luster, and it does not fluoresce. In index oil in transmitted light, shocked zircon grains consisting almost entirely of reidite are transparent. Pleochroism was not observed. Reidite appears to have parallel extinction and is length slow. The maximum birefringence is roughly 0.015. Reidite appears to be uniaxial positive. It is tetragonal, space group $I4_1/a$, a = 4.738 (1) Å, c = 10.506 (2) Å, V = 235.84(2) Å^3. Previous shock-loading experiments on zircons indicate that the transition to reidite starts at about 30 GPa and is completed around 53 GPa. Reidite should be a useful indicator of peak pressure in shock metamorphosed rocks. Reidite is named after Alan Reid who first produced this phase in the laboratory.