

Structural phase transition in ZrO₂ induced by swift heavy ion irradiation at high-pressure

Schuster B, Lang M, Klein R, Trautmann C, Neumann R, Benyagoub A
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Exposing pressurized crystals to GeV heavy ions reveals unexpected structural changes. Irradiated at ambient conditions, natural zirconia (ZrO₂) transforms from the monoclinic structure to its tetragonal (high-temperature) phase. For this process the required fluence must exceed 5×10^{12} ions/cm² for Pb and U and becomes even significantly higher for lighter ions. If samples are pressurized during irradiation using diamond anvil cells, the required fluence drops at least by one order of magnitude. The efficiency of the monoclinic to tetragonal phase transition becomes larger with increasing pressure.