

INVITED CENTENNIAL REVIEW

High-pressure minerals

OLIVER TSCHAUNER^{1,*}

¹Department of Geoscience, University of Nevada, Las Vegas, 4505 Maryland Parkway, Las Vegas, Nevada 89154-4010, U.S.A.
Orcid: 0000-0003-3364-8906

ABSTRACT



This article is dedicated to the occurrence, relevance, and structure of minerals whose formation involves high pressure. This includes minerals that occur in the interior of the Earth as well as minerals that are found in shock-metamorphized meteorites and terrestrial impactites. I discuss the chemical and physical reasons that render the definition of high-pressure minerals meaningful, in distinction from minerals that occur under surface-near conditions on Earth or at high temperatures in space or on Earth.

Pressure-induced structural transformations in rock-forming minerals define the basic divisions of Earth's mantle in the upper mantle, transition zone, and lower mantle. Moreover, the solubility of minor chemical components in these minerals and the occurrence of accessory phases are influential in mixing and segregating chemical elements in Earth as an evolving planet. Brief descriptions of the currently known high-pressure minerals are presented. Over the past 10 years more high-pressure minerals have been discovered than during the previous 50 years, based on the list of minerals accepted by the IMA. The previously unexpected richness in distinct high-pressure mineral species allows for assessment of differentiation processes in the deep Earth.

Keywords: High pressure, deep Earth, crystallography, mineral physics