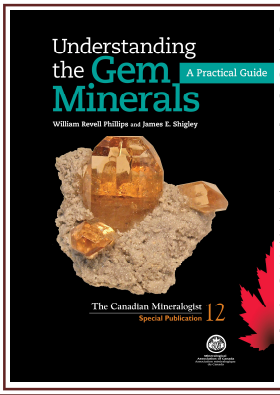
Mineralogical Association of Canada

Special Publication 12



Our book is intended to bridge the gap between the complex science of mineralogy and the rock hound's field guide of rocks and minerals. We begin with the elements, the building blocks of minerals, and which of the ninety-two naturally occurring elements are really important to us in building crystals of the minerals we call gems. The arrangement of these building blocks is as important as the identity of the elements themselves, and the crystal structure (i.e., atom arrangement) is expressed by crystal form and symmetry resulting in crystal systems and classes.

The behavior of light in a gem crystal determines its brilliance and dispersion and is completely unlike light's familiar behavior in air, water or glass. Specific elements and imperfections in crystal structure yield the color of our gems which may be stable or unstable. Element bonding forces in crystals are metallic, covalent or ionic. Metallic bonding yields soft metals like gold and silver or hard metals like tungsten and chromium depending on the atom arrangement. Platinum may be either hard or soft. Diamond is the only mineral which is completely covalent which accounts for its extreme hardness, brilliance and other unique characteristics. Diamond is truly unique in both properties and geologic occurrence. Most minerals are ionic or mixed bonds. Most minerals are silicates (i.e., containing SiO_2), and may be blocky, fibrous or sheet structures depending on the number of oxygen ions shared between two silicon ions. The chemical formula of a mineral, if written properly, should tell us if the mineral is blocky, fibrous or micaceous in addition to its probable color, hardness, brilliance and suitability as a gem mineral. The chemical formula and crystal system of a mineral are not trivial bits of information – they hold a world of information for those who understand the gem minerals.

This book is entitled "Understanding the Gem Minerals" for a reason. There is much to know and learn for those who care.

William Revell Phillips

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