Hardness of Gem Stones

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The Hardness of Gem Stones
The hardness of almost any material is of considerable importance when it has to stand up to a great deal of wear and tear, This toughness is con¬sidered to be of special importance with regard to gem minerals, since not only should they be able to stand up to a considerable amount of wear, often through decades or even centuries, but they must also be durable and able to withstand millions of years of harsh treatment by nature while they are still being washed about in rivers, streams, or crushed by mountains long before we find them and make them into gems.

The hardness of a gem stone may best be defined as the amount of resist¬ance its surface sets up when an attempt is made to scratch it with another stone or object. Diamonds are sometimes used to cut window glass. In the same way, an emerald can be scratched with a ruby, but not the other way around, because the latter is harder than the former.

In order to simplify the method of expressing the various degrees of hard¬ness, a German physicist, Friedrich Mohs (1773-1839), devised an arbitrary scale of hardness. He took ten minerals and arranged them in the order of their respective hardnesses. Thus, diamond was placed at the top of the scale, with its hardness assigned as number 10. The ruby came next, with hardness 9; then followed the topaz, with hardness 8; and quartz, with hardness 7; feldspar, 6; apatite, 5; fluorite, 4; calcite, 3; gypsum, 2; talc, 1.

The numbers in the hardness scale are only an indication of the order of hardness and have no other significance. Thus, the hardness interval between diamond and ruby is far greater than that between ruby and topaz. This simply means that the ruby is the next hardest natural substance on earth after the diamond; however, the hardness interval between those first two is so great that it exceeds that between ruby (hardness 9) and talc (hardness 1).

Testing the identity of stones simply by scratching one with another may seem at first to be a simple and quick method, but such tests are not really permissible. If you possessed an emerald ring and someone tested it for hard¬ness with a diamond, it might be badly scratched and lose much of its value. For this reason, hardness tests are much frowned upon and should not be used if damage is likely to result.

The surprising thing is that the same mineral crystal may possess a number of different hardnesses. There is, for example, an interesting mineral called cyanite, the crystals of which, in some directions, are soft enough to be scratched with a steel-bladed knife but will resist all attempts in other di¬rections. The reason for this extraordinary behavior can again be traced back to the regular atomic patterns within the crystals, which will resist the steel blade in some directions but not in others, and is one more example of their directional properties.