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SUBJECT: Use of Ward's Hardness Points

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Friedrich Mohs devised a scale of relative scratching hardness in the early 19th century. It was recognized that minerals, glazes, etc. possessed a variety of hardnesses. In general, sulfides tended to be relatively soft and silicates tended to be relatively hard. As a specific hardness could be assigned to most minerals, measuring this physical property would aid in the identification of minerals in general. A standard of hardness was all that was needed.

MOH'S SCALE OF HARDNESS

1. Talc	6. Microcline
2. Gypsum	7. Quartz
3. Calcite	8. Topaz
4. Fluorite	9. Corundum
5. Apatite	10. Diamond

Mohs was not the first or last person to propose a scale of hardness. The universal acceptance of his scale in mineralogy, however, has enabled consistent mineral descriptions and identifications to be the norm rather than the exception.

Moh's scale is not linear but instead varies by small similar-sized steps in the low numbers and varies by progressively larger steps in the high numbers. The graph illustrates how Moh's scale compares with "true" hardness as expressed by

comparison with diamond.

DETERMINATION OF HARDNESS

Moh's scale is a comparative scale. Either a substance is or is not scratched by another. Materials with the same hardness will scratch each other slightly. The "Mohs Hardness" is the hardness of the material which just barely scratches the specimen being tested. It should be remembered that there is a spectrum of hardnesses and that the ten steps used by Mohs apportion the commonly encountered range of hardnesses over the span from talc to diamond. Thus, gamet might scratch quartz (7), but not topaz (8) and be assigned a value of7 1/2. As the Mohs scale is not strictly quantitative, no smaller divisions are used such as 1/8, 1/4, etc. Ranges such as 7.0 to 7.5 are frequently reported, however. (The scratching hardness is indirectly a measure of atomic bond strength. For this reason, hardness varies with direction of scratch with respect to the orientation of the crystal structure of the test mineral). Some minerals have extreme anisotropic hardness, which depends on direction (e.g. kyanite, diamond, etc.), but usually the difference is not perceptible.

MOHS HARNESS OF COMMON MATERIALS

2-1/2 Finger	Nail 7-1/2 Zircon
3 Copper Coin	8 Hardest Glazes
5 Window Glass	1 Vinyl & Asphalt Tile
5 Softest Glazes	3 White Marble
6-1/2 Rutile	4 Black Marble

USE OF HARDNESS POINTS

Ward's hardness points are designed to yield consistent hardness determinations within the range 5 to 10. Natural minerals (which are too brittle for hardness point mounting) should be used to cover the lower range of 1 to 4.

1. Carefully select a flat area to be tested. (Many hardness determinations are made on the incorrect substance).
2. Position the hardness point perpendicular to the test surface. Press down firmly and move the hardness point across the test surface to produce a scratch. (Do not tilt the hardness point while scratching as the tip might shear off).
3. Blow away any powder produced and examine the surface using a hand lens to see if a scratch was made.
4. Repeat the procedure using a harder point if no scratch was produced or use a softer point to make sure that the initial point used was not too hard.

NOTE: Hardness is the resistance to being scratched. Diamond, which is the hardest of minerals, is also very brittle. Tenacity is not directly related to hardness.
Minerals may exhibit apparent hardness contrary to published data. The reasons for this discrepancy include: chemical variations, brittleness, alteration and leaching, gouging of a loose aggregate which appeared to be a single grain, etc.