

“Minerals that do things...”

Hands-on demonstrations of mineral properties

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Soft as a Baby’s Skin

Object: Every student encounters the **Moh’s Hardness Scale** in science class. The concept of **relative hardness** is easily in theory but more difficult to demonstrate in practice. It is easier to experience relative hardness at the soft end of the hardness scale.

Procedure description: Students scratch samples with their fingernails, ranking them as harder or softer. Care must be taken to avoid mistaking a dust trail for a scratch. For instance, talc rubbed against gypsum will leave a white trail that at first looks like a scratch. But if you wipe away the dust, you will see that the gypsum is unmarked. Talc or soapstone has a Moh’s hardness of 1 and is even softer than your skin. Your fingernail can scratch gypsum, which has a hardness of 2, but not calcite, with a hardness of 3. Your fingernail thus has a hardness of about 2.5. Once the specimens are ranked by hardness, show that softer ones cannot scratch harder ones. Thus talc cannot scratch calcite, etc.

Specimens to test: Talc (soapstone); gypsum; serpentine; calcite; graphite.

Equipment needed: Just your fingernail and your hand.

Scientific discussion: Your fingernail has a Moh’s scale hardness of 2.5. It is harder than talc and gypsum, but softer than calcite. Because it is possible to get good, inexpensive crystals of gypsum and cleavage fragments of calcite with clean flat faces, it is easy for students to see if their fingernails really can or cannot scratch these minerals.

Hardness of a solid is a function of the strength of the chemical bonds between atoms and the arrangement of the atoms. Often it is difficult to tell if a mineral is scratching another mineral or if it is really just powdering itself against it. The talc-gypsum-calcite sequence is relatively easy to determine if you compare them against your fingernail.

Additional possibilities: Serpentine varies widely in hardness (about 2.5 to 5 on Moh’s scale) so you have to test individual specimens before using them in demos. Graphite is a good addition because it is quite soft (1.5), but it can make a mess if not kept under control.

Notes for demo tables: If you are doing demonstrations for large numbers of visitors (such as at a booth at a trade show), I’ve found that the simplest way to talk about hardness (or rather softness) is to set out a large block of soapstone, encourage visitors to touch it, and ask them what it feels like. Some will say “soap,” which is where soapstone gets its name, of course. Tell them to rub their hands across the stone and look at their hands – they’ll see a shiny white powder on their fingers. “This mineral is so soft,” I tell them, “that it is actually softer than your skin.” I also keep a bottle of talcum powder nearby to show them that we’re really using a mineral when we use talcum powder.