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# "A" Mica

I have always found it difficult to resist the temptation to peel layers from a specimen of scrap mica. It is simply fun to do, perhaps because it provides a tactile observation of the uncommon combination of properties found in mica. It is the same reason that Silly Putty is fun to play with. The perfect cleavage, flexibility, and elasticity as well as the strength within a layer of mica are all physical properties that allow its crystals to be peeled apart. With diligence, a mica sheet as thin as 0.0025 cm (1 mil) can be created. When a suitably thin (approximately 1-mm) sheet of mica is peeled, it can be easily cut with a pair of scissors, much like a sheet of cardboard or plastic. This is definitely not a behavior usually attributed to crystals. The physical properties that allow the creation of these thin sheets, which can be tailored to any shape by simple cutting or machining, combined with such other properties as their high heat and electrical insulation, thermal and chemical resilience, and high dielectric strength, make mica ideal for numerous technological uses. When ground into fine powders, mica also has many industrial and technological applications. Its uses are so widespread and significant that mica surely ranks as one of the essential minerals for modern society and is of great strategic importance.

**"A" mica with included pyrope, McKinney mine, Mitchell County, North Carolina; Terry Huizing specimen and photo.**

The principal demand for sheet mica (macroscopic crystals) comes from the electronic and electrical industries, where it is used as an electrical insulator or as a *dielectric* (a substance that is a poor conductor of electricity but an efficient supporter of electrostatic fields) in capacitors. It is also used for a plethora of other applications, including high-pressure steam-boiler windows, optical instrumentation, laser devices, medical electronics for radiation treatment, diaphragms for oxygen-breathing equipment, optical filters, retardation plates in helium-neon lasers, pyrometers, thermal regulators, missile systems, radar systems, aerospace components, and the penultimate: woofers in high-end stereospeakers (Hedrick 2004). In powder form (microscopic crystals), mica has many uses, including being used as a "filler" in wallboard mud, rubbers, and plastics; as a nonstick coating in molds; and as a rheological control agent in paints and cosmetics.

With the nanotechnology revolution at hand, mica has found a new and important application as a substrate for creating and studying nanoparticles and thin films. Such applications require materials with large areas that are atomically smooth and free of steps and other disruptions. In the case of mica, these requirements can be met with an ease that no other material, natural or synthetic, can even approach.

All mica, however, is not created equal. In their article on the Hogg Estate (this issue), Barwood and Cook mention *"A" mica*. This is a term used to describe a particular cleavage morphology found in some mica crystals (Sterrett 1923; Jahns and Lancaster 1950; Jahns, Griffitts, and Heinrich 1952). Rather than cleave perfectly along a continuous plane, *"A" mica* breaks in such a way that there is a stepped or corrugated chevron effect that resembles a printed capital "A." Actually, the crystals look more like the letter "V;" however, early miners coined the term *"A" mica*, and it has stuck. *"A"-type mica* and *"A" structure* are used synonymously. The steps or corrugations are themselves known as *reeves* and are hypothesized to be the result of flexure from post or syngenetic stresses in the mica. Discontinuities in incomplete sheets within a crystal can also lead to this effect (Jahns, Griffitts, and Heinrich 1952). The cleavage in "A"-type mica, as well as other defects that prevent perfect cleavage, renders it unusable in many applications, considerably reducing its economic value.

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