TRAUMATISM IN THE MINERAL WORLD: Facts and Comments

Boris Z. Kantor
Russian Mineralogical Society RAS, boris_kantor@mail.ru

Author's specimens and photographs.

In a million years even a weak influence can leave its distinct imprint on a mineral. But in the depths of earth, the influences may be not weak at all. A minerals natural environment is a dynamic and chemically aggressive medium. That is why minerals often come to us marked with scars of various injuries – mechanical deformations and etchings.

But how does a mineral itself behave? A specialist would consider as absurd the phrase «active minerals» readily used in illiterate ads: were a mineral active, it could not exist at all. And, indeed, most people consider a mineral as lifeless and inert matter, a symbol of passivity. Nonetheless: is it able to respond to an injury somehow? The question is very interesting, and we are now going to get the answer from minerals themselves or, to be more exact, their photographs.

Let us begin with the beryl crystal from Volyn', Ukraine, shown in Photo 1. Its strict hexagonal habit is thoroughly lost as if it were a piece of candy left in

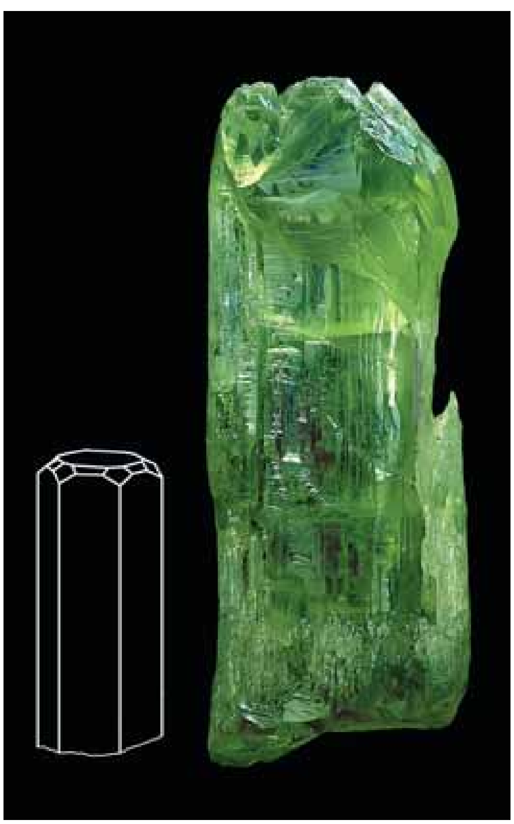

Photo 1. **Beryl** crystal, 9 cm high. Volyn', Ukraine.

Photo 2. **Calcite**, 6 cm high. Klichka, Transbaikalia, Russia.

water for a long time. In fact, this was just the case: what happened with beryl, a hard mineral that resists even strong acids, is due to the action of water, quite a harmless liquid in everyday use. Under environmental conditions, water is the sole solvent for minerals. What makes it so aggressive, is the admixture of CO_2^{3-}, Cl^-, F^- and some other elements combined with high temperatures and pressures as well as its unimaginably long time intervals.

Calcite is far less resistant than beryl. It is slightly soluble even in pure water and, to a much greater extent, in the presence of carbon dioxide. At the same time, various crystallographic forms which are so numerous for calcite yield to etching differently. Water, presumably enriched in carbon dioxide, has etched thoroughly the surface of the crystals shown in Photo 2, and has penetrated inside, eliminating the crystals' middle parts, and touching slightly their cores. Now the crystal's insides can be seen: each crystal has evidently changed its habit twice while growing, once from prismatic to scalenohedral and then to the keenest rhombohedron combined with a pinacoid. So the crystal turned out to be made up of three forms as if enclosed one in another (Fig. 1). The scalenohedron yielded to etching to the greatest extent while the prismatic core was most stable.

Such injuries happen when crystal growth is aborted and dissolving forces come into action. Under favorable conditions, the interrupted growth process may resume. The crystal then hurries, first off, to regenerate and recover its regular and flat faces. It behaves like a living being: treatment – first and foremost! However, there is no mystery in this responsiveness; the latter's mechanism is both simple and natural. Fig. 2 shows a crystal section with a trauma, a socket on its surface. Black lines denote chemical bonds between particles while red arrows are the free bonds of the particles located on the crystal surface. The free bonds create a field of force around the crystal, which performs the work to deliver crystallizing particles to the crystal from its nearest environment. Above the distribution is shown of the field gradient along the surface. It is clear from the drawing that the strongest field is located exactly at the trauma. Because of the field

Fig. 1. Structure of the calcite crystal shown on Photo 2.

Fig. 2. Field of force around a damaged crystal.