

The Mineralogical System: Behavior of Important Physical Properties

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This project involves 3001 refractive indexes of minerals, 1933 densities, 565 reflectances, and 462 Vickers hardnesses (VHN). End-member formulae of 4973 minerals were projected into two variables, *Qual_4* and *InfEnt*, the first being a function of the atomic numbers of elements present, the second, an indication of complexity of the stoichiometry. The aim was so explore whether physical data exhibit any tendencies across the whole mineralogical system.

Best results were obtained with physical data (*Z* coordinate) on logarithmic scale. Both *Qual_4* and *InfEnt* are logarithmic as well. Among the number of models tested, all datasets yielded meaningful results when physical data were treated as a planes in *X, Y, Z* space.

Planes fitted to the first three physical data exhibit a pronounced increase with increasing atomic numbers of elements present (*Qual_4*) and a mild decrease with increasing complexity of formulae

(*InfEnt*). Contrariwise, the behavior of Vickers VHN is the opposite: a decrease with *Qual_4* and an increase along the *InfEnt* axis. All tendencies are convincing despite significant scatter in the plots.

The mineralogical interpretation of the results remains open, this appears to be a first attempt of the kind. However, the regression equations allow anyone to calculate **rough estimates** of physical data from input chemical coordinates *Qual_4* and *InfEnt*. Of course, minerals and inorganic compounds are built of the same elements, and the relationships found may be valuable to both mineralogy and chemistry, but such “predictions” of physical data should be treated with considerable caution.

Biography

Milan Rieder defended his Ph.D. at Johns Hopkins University in 1968 (28 years old). Before retirement, he was a professor of mineralogy at Charles University Prague and Technical University Ostrava, and he (co)authored about 110 papers in peer-reviewed journals. In 1976–1998, he chaired the Mica Subcommittee (International Mineralogical Association), and later served 23 years as an Editor of Physics and Chemistry of Minerals.