

THE POLYMORPHISM OF CELSIAN ($\text{BaAl}_2\text{Si}_2\text{O}_8$)

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There are four distinct polymorphs of $\text{BaAl}_2\text{Si}_2\text{O}_8$, including the natural minerals, celsian and paracelsian, and two forms recognized only from synthetic products, although one is related to the natural mineral, cymrite. Their inter-relationships have not been clearly defined, and four conflicting polymorphic schemes have been proposed.

Prolonged anhydrous and hydrothermal heating experiments have been made on natural and synthetic materials. These have confirmed the following polymorphic relations: Monoclinic celsian is the stable form up to 1,590 °C, where it undergoes an extremely sluggish reversible inversion to hexagonal hexacelsian. The latter, stable to the melting point at about 1,760 °C, undergoes a rapid reversible inversion to an orthorhombic form on cooling through 300 °C. Paracelsian appears to be a metastable polymorph, and changes monotropically through hexacelsian to celsian at all temperatures at least as low as 500 °C. A phase diagram incorporating these findings is presented.

COPPER-NICKEL MINERALIZATION ASSOCIATED WITH DIORITIC INTRUSIONS IN THE BANCROFT-MADOC AREA, ONTARIO

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Several mafic complexes in the Bancroft-Madoc area show trondhjemitic differentiation trends and have average modal compositions ranging from diorite to rocks intermediate between diorite and tonalite. In some of these complexes, copper-nickel mineralization is found in dikes and irregularly shaped bodies of pyroxenite and peridotite. The mineralization, mainly pyrite, chalcopyrite, and pyrrhotite with exsolved pentlandite, is disseminated in the ultramafic rock, and massive sulphide zones are common. Where mineralized, the ultramafic rock has undergone intense hydrothermal alteration.

The dioritic bodies are mainly composite intrusions related in time and space with epizonal albite granite and syenite plutons and mesozonal trondhjemitic and granodiorite plutons, and all these plutonic rocks form a biotite diorite series, about $1,250 \pm 25$ m.y. old, restricted spatially to metavolcanic sequences in the area. From detailed study of four dioritic intrusions, nickeliferous ultramafic phases appear to be common only in those that contain (1) a high proportion of tonalite and quartz-bearing diorite, (2) wide-spread deuteric alteration that has caused almost complete uraltization of pyroxene and some alteration of plagioclase, and (3) an average ferromagnesian mineral content greater than forty per cent in gabbro and diorite phases. Iron-titanium oxide minerals from gabbroic and dioritic phases of the Thanet complex, which contains the largest nickel deposit found to date, have greater trace amounts of nickel and cobalt than iron-titanium oxide minerals from mafic phases in the other intrusions with no nickel concentrations. Such trace element data may prove useful in future exploration for copper-nickel deposits in this area.

REFLECTANCE SPECTROPHOTOMETRY IN MINERALOGY

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Reflectance values of finely ground mineral samples were measured at selected wavelengths in the visible spectrum with a spectrophotometer equipped with an integrating-sphere reflectance attachment. Trichromatic coefficients calculated from the reflectance

data were found to characterize colour much better than present terms, such as "pale yellow", "dark red", etc. The following data were obtained from six of the samples studied:

Substance	Trichromatic coefficients			Usual colour designation of powder
	<i>x</i>	<i>y</i>	<i>z</i>	
Azurite	.1675	.2311	.6014	Blue
Malachite	.2867	.3485	.3648	Pale green
Synth. K_2CrO_4	.3905	.4449	.1646	Canary yellow
Calcite	.3140	.3220	.3640	White
Synth. Fe_2O_3	.4009	.3357	.2634	Reddish brown
Cinnabar	.4148	.3198	.2654	Scarlet

Reflectance data not only characterize colour, they can be used also to determine the amount of coloured material present in a binary mixture such as hematite and quartz. This yields the following results:

Weight % Fe_2O_3 in SiO_2	Reflectance (%) at 620 μ
0.00	88
5.00	54
10.00	47
15.00	43
20.00	39
40.00	36
100.00	30

By means of reflectance it should be possible to determine the amount of mechanically admixed Fe_2O_3 in SiO_2 to within $\pm 1\%$ for samples containing up to 20% Fe_2O_3 . This method also has been used to determine the chromophore content in an isomorphous series (Fe in sphalerite).

The availability of reliable, modestly-priced spectrophotometers should make the quantitative determination of colour a routine matter in mineralogy.

THE ROYAL ONTARIO MUSEUM'S NEW GALLERY OF MINERALOGY

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The International Nickel Company gave the Royal Ontario Museum \$150,000 to design and build a new Gallery of Mineralogy which will open in November, 1967. This gallery is the first in its field to try to teach mineralogy as well as display minerals.

We thought the layman would better appreciate a display of minerals, if he first learned what minerals are, how they formed in nature, how one mineral can be distinguished from others, etc. Accordingly, the visitor will be introduced to chemistry, crystallography, physical properties, optical properties, x-ray diffraction, identification, and genesis of minerals. Throughout this "course" he can perform scientific experiments himself to help him understand some of these principles. He can prove the Law of Constancy of Interfacial Angles; measure the refractive indices and birefringence; estimate specific gravity; and identify a mineral with a special "computer".

Under most of these teaching exhibits we have installed small cases set at a child's-eye level. Many of these "kiddy" cases have push buttons and cranks which activate