

Mineralogical Chemistry.

Theory of Magmatic Mineral-forming Agents. JOHANN JAKOB (*Zeitsch. anorg. Chem.*, 1919, **106**, 229—267).—An important part in mineral and rock formation has undoubtedly been played by the gaseous and more or less easily volatile substances present in the magma. Among these mineral-forming agents water is by far the most important; other agents discussed include hydrogen sulphide, hydrogen fluoride, the oxides of carbon, sulphur dioxide, titanium dioxide, and a number of the less common metallic and non-metallic oxides. A precise definition of a mineral-forming agent cannot be given, but it must possess the property of forming additive compounds with other substances present in the fluid magma. These compounds are supposed to be of the co-ordinated type and generally to form mobile, complex ions. Through the interaction of these complex ions in the magma the different minerals are formed. For the purpose of discussion, the magma is considered as a highly concentrated solution of the other constituents in the mineral-forming agent; for example, in the case of water, as an aqueous solution. Hydrated forms of the different oxides present are probably produced, in which the elements can be supposed to exert the maximum co-ordinating power, with formation of such compounds as $[(\text{H}_2\text{O})_2\text{Si}(\text{OH}\cdot\text{OH})_4]\text{H}_4$ and $[\text{Mg}(\text{OH})_2(\text{OH}_2)_4]$.

At the high temperature of the magma, water is comparatively highly dissociated, and the hydrogen and hydroxyl ions combine with the hydrated compounds to form complex hydrated ions, through the interaction of which the different minerals are formed. New formulæ of the co-ordinated type are suggested for some of the complex silicates. The same ideas are applied to the discussion of rock metamorphosis.

E. H. R.

Chemistry of Coal. I. Action of Pyridine on the Coal Substance. WILLIAM A. BONE and REGINALD J. SARJANT (*Proc. Roy. Soc.*, 1919, [A], **96**, 119—136).—Experiments on the solvent action of pyridine on coal have shown that the presence of oxygen has an important retarding action, varying with the nature of the coal, on the extraction process. This is due to the oxidation of the coal substance which may occur before or during the extraction. Previous oxygenation of the coal renders it much less susceptible to the solvent action of pyridine. The presence of water in the pyridine also has a retarding influence. To obtain concordant results

it is therefore necessary to exclude air, to use carefully dried and purified pyridine, and in addition to grind the coal to a standard mesh and to have a standard form of extraction apparatus. Such an apparatus is described in the present paper. The picolines extract about the same amount as pyridine, but, owing to their greater instability, they are less suitable as solvents. When the pyridine extract, which may amount to more than 30% by weight of the original coal, is again extracted with chloroform about 50% is dissolved. According to Clarke and Wheeler (T., 1913, **103**, 1704), the chloroform effects a complete separation of the resinic from the cellulosic constituents of the coal, but the analysis of the pyridine-chloroform extract does not warrant the view that it represents even an approximately pure coal resin. [See also *J. Soc. Chem. Ind.*, 1919, October.] E. H. R.

Relations between Tridymite and Cristobalite. C. N. FENNER (*J. Soc. Glass Tech.*, 1919, **3**, 116—125).—The author disputes the conclusion of Rees (*J. Soc. Glass Tech.*, 1918, **2**, 253), Scott (*ibid.*, 1918, **2**, Abs. 169), and Le Chatelier (A., 1917, ii, 97) that tridymite is more stable than cristobalite at temperatures above 1480°. He cites numerous experiments to the contrary, and states that in the course of a long series of experiments, no obvious loophole was left by which it was possible to escape the conclusions regarding the stability relations which have been drawn. At temperatures above 1470±10°, quartz, tridymite, and amorphous silica have repeatedly and unequivocally been converted into cristobalite; between 1470±10° and 870±10°, quartz, cristobalite, and amorphous silica have similarly been converted into tridymite; and below 870±10° tridymite, cristobalite, and amorphous silica have been converted into quartz. These relations have been confirmed again and again. Moreover, recent work by Ferguson and Merwin (A., 1918, ii, 362) has indicated that the melting point of tridymite is considerably lower than that of cristobalite. It follows necessarily from this observation that cristobalite is the high-temperature form. [See *J. Soc. Chem. Ind.*, 1919, 722A.] A. B. S.

Composition of Bornite. AUSTIN F. ROGERS (*Science, New York*, 1915, [N.S.], **42**, 386—388).—The formula proposed by Kraus and Goldsberry (A., 1914, ii, 570; compare Allen, A., 1916, ii, 391) is discussed. Fifty-nine published analyses are plotted on a triangular diagram; they all fall near the line CuFeS_2 to Cu_2S , with the greatest cluster near Cu_5FeS_4 , and lower and upper limits near Cu_3FeS_3 and $\text{Cu}_{12}\text{Fe}_3\text{S}_9$. The most probable explanation of the variations in composition of bornite is that of a solid solution of Cu_2S in Cu_3FeS_3 , the formula being written as $\text{Cu}_3\text{FeS}_3(\text{Cu}_2\text{S})_x$. L. J. S.

Scapolite of Gem Quality from the Pegmatites of Madagascar. A. LACROIX (*Compt. rend.*, 1919, **169**, 261—264).—Transparent, yellow scapolite occurs as corroded and striated square prisms several cm. in length, together with beryl, euxenite, and monazite, in a potash-pegmatite at Tsarasaotra on the Tsibohaina

river. D 2·67. Optically uniaxial and negative with slight pleochroism, $\omega_{Na} = 1·5698$, $\epsilon_{Na} = 1·5490$, $\omega - \epsilon = 0·0208$. It is father harder (H $6\frac{1}{2}$) than ordinary scapolite and shows no cleavage, the fracture being conchoidal. Estimations of some of the more unusual constituents gave (compare this vol., ii, 163):

CO ₂ .	Cl.	F.	SO ₃ .	SrO.	FeO.	Fe ₂ O ₃ .
2·52—2·71	1·59	0·37	nil	0·09	0·90	0·11

Cut stones resemble certain beryls in appearance and in some of their characters; there is, however, a marked difference in the strength of the double refraction and in the hardness. L. J. S.