

*Calcite crystals from a water-tank.*By RUSSELL F. GWINNELL,¹ B.Sc., A.R.C.Sc., F.G.S.

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[Communicated by Dr. C. G. Cullis, and read November 12, 1912.]

A CRYSTALLINE deposit of sufficient interest to warrant description was brought to the author's notice by Mr. Henry Preston, F.G.S., who has recently described its mode of occurrence.² The material consists of a white, glistening, crystalline powder, or a sand-like aggregate of minute crystals. It was deposited in a water-tank into which water was led through an old leaden pipe, over a mile in length, from a spring rising from the basal ferruginous beds of the Marlstone (Middle Lias) in Belton Park, north of Grantham, Lincolnshire. The sand was deposited in the tank as a conical heap, spreading over a base of perhaps four square yards and reaching a height of seven or eight inches at its summit. It formed during the dry summer months of 1911, when the inflow of water, though never ceasing, was never more than a trickle. Since that season the flow has been greater and no further deposit of crystals has formed, but only mud.

No crystals were deposited in the catchpit at the intake end of the pipe, and the hardness of the water was slightly greater there than at the outfall end. It is obvious, therefore, that the crystals were formed during the passage of the water through the long pipe, when the free surface of water was large as compared with its volume.

An analysis of the deposit, kindly made by Miss M. B. Chapman, B.Sc., D.I.C., gave the following result:—

CaCO ₃	...	...	95.65
Al ₂ O ₃	...	...	0.93
Fe ₂ O ₃	...	...	0.21
SiO ₂	...	...	3.14
Insoluble residue	...	...	0.06
			99.99

¹ The author of this note died suddenly on March 15, 1913, at the early age of 33 years.

² H. Preston, 'Calcite sand at Belton, Grantham,' *Trans. Lincolnshire Naturalists' Union*, 1912 (for 1911), vol. ii, pp. 307, 308.

The material dissolved with brisk effervescence in dilute hydrochloric acid, leaving a slight residue, the mineral characters of which could not be identified under the microscope.

Microscopic examination of the deposit itself shows it to consist entirely of transparent, colourless crystals, mostly of undistorted rhombohedral form. While a few crystals reach 0.2 mm. in greatest length, the majority lie between 0.05 and 0.15 mm. Isolated crystals are common, and aggregates of two, three, or more individuals are also found. These aggregates do not appear in any cases to be twins, but they are frequently due to parallel growth. The crystals have the

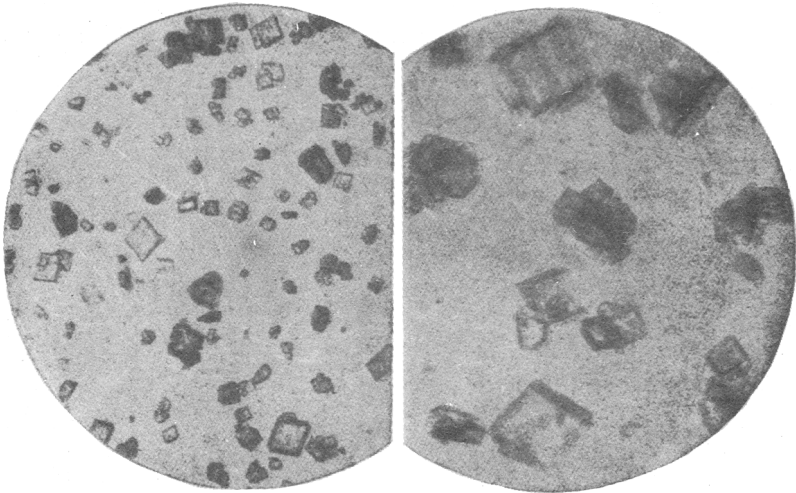


FIG. 1 ($\times 25$).

FIG. 2 ($\times 50$).

Photomicrographs of Calcite crystals from a water-tank.

appearance of the primary rhombohedron r ($10\bar{1}1$) of calcite; but it must be remembered that the acute rhombohedron f ($02\bar{2}1$) may present much the same general appearance, since the interfacial angles of these two rhombohedra are approximately supplementary. The form of the undistorted crystals was observed, however, to be symmetrical with respect to a line joining the obtuse angles rather than to a line joining the acute angles of the faces; thus proving that the rhombohedron is r and not f . This conclusion was afterwards confirmed when cleavage-cracks were noticed in a few of the crystals.

The unit or cleavage rhombohedron r ($10\bar{1}1$) is distinctly uncommon as a simple crystal-form in calcite, although usual in dolomite, &c. That

the mineral is calcite, nevertheless, and not dolomite, was proved, apart from chemical analysis, by optical means and by specific gravity. The latter was determined by the diffusion column to be 2.71. To determine the refractive indices the crystals were immersed in mono-bromonaphthalene and examined in plane-polarized light. Using monochromatic yellow light, it was found by Schroeder van der Kolk's method that for the ordinary ray the refractive index was approximately the same as that of the liquid ($n = 1.66$), while for the extraordinary ray it was much lower. Examined in white light, the colour-fringes given with the ordinary ray confirmed the closeness of its refraction to that of the immersing liquid. This agrees well with calcite and precludes dolomite, which has higher refraction.

The deposition of these rhombohedral carbonate crystals under artificial conditions is of geological interest as bearing on the probable mode of origin of somewhat similar occurrences under natural conditions; and such have been recorded from a number of geological horizons. It tends to strengthen the view put forward by Dr. C. G. Cullis,¹ that the presence of similar crystals of dolomite in sediments of argillaceous character is indicative of direct precipitation from solution concurrently with sedimentation of the associated clayey matter. The alternative views that have been advanced to account for their presence in some of these deposits—as by mechanical transport or by metasomasis—obviously cannot explain the present occurrence.

¹ C. G. Cullis, 'On a peculiarity in the mineralogical constitution of the Keuper Marl,' Rep. British Assoc. (Leicester), 1907, p. 507.