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Certain Minerals of Webster County, Iowa

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The critical temperature can be calculated from measurements of surface tension, leaving only two series of data which may be correlated by the method of comparison, since both the tenacity of the solid and the surface tension in the liquid state can be found for some elements.

Unfortunately I have not been able to collect sufficient data to draw the curve even approximately, but an inspection of the elements on Meyer's curve shows that the curve in space will approximate a spiral, of which Meyer's curve is a projection. For example: The volatile element fluorine and the metal magnesium will stand near the top and bottom of the curve respectively, and in general the elements on the rising branch will be high, and those on the falling branch of Meyer's curve low, with respect to the third co-ordinate. Melting points, boiling points, hardness, and other related properties of the elements are likely to be much more clearly represented on this curve than they are by either Meyer's or Mendeleeff's system.

CERTAIN MINERALS OF WEBSTER COUNTY, IOWA.

BY ARTHUR C. SPENCER.

Within the limits of Webster county are found a number of interesting minerals. The following notes are descriptive of a few of them.

Quartz. In the vicinity of Fort Dodge the sandy deposits overlying the gypsum are full of rough calcareous concretions of irregular shape. These formations are never hollow like geodes, but like them consist largely of quartz crystals. Calcite showing little or no crystalline character surrounds and incloses perfect crystals of doubly terminated quartz. These small crystals rarely exceed 3 mm. in length. They show only the simple forms of the unit prism and the unit rhombohedron. Its intimate association with calcite indicates that the quartz was without doubt deposited by circulating carbonate or alkaline waters.

Pyrite. Though of very frequent occurrence throughout the coal measures of Webster county no good crystals have

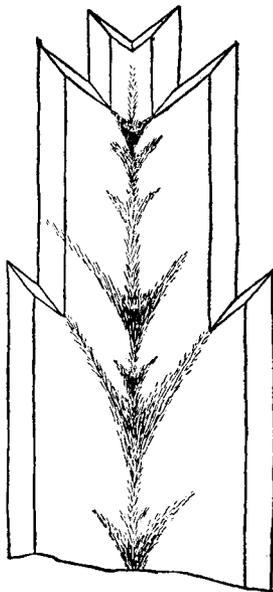
been noted, though careful search would doubtless reveal well crystallized specimens. The mineral occurs in masses disseminated through the coal and shale with slightly projecting crystals, showing the octahedron and cube, the latter often with curved faces. Certain layers of the brick shales are rejected because of its presence. At the clay pit of the Fort Dodge Pressed Brick Company a good sized stigmairia impregnated with pyrite was found. The pyrite is associated with gypsum, crystals of which are often found clustered around masses of it. Pseudomorphs of limonite after pyrite are common in the Saint Louis limestone.

Celestite. Sulphate of strontium has been noted at several places. It is usually in fibrous layers from a quarter to three inches thick in the coal measure sandstones and shales. The seams are variously inclined, one observed having a high angle. A cross-section of the vein showed two or three layers, indicating that the fissures had been widened at different times. White* who had evidently seen only the horizontal seams suggested that the joints were connected with the stratification of the inclosing shales. The same writer stated that the fibers are perpendicular to the plane of the layer, but samples have been obtained where their direction is variously inclined. An inspection of the material collected from the bed of the river a mile or so below Fort Dodge also brings out a variation in the angle between the long direction of the fibres and the basal cleavage. In those seams which are horizontal the cleavage is parallel, or nearly so, to the plane of the layer and the fibers are at right angles to this. In the mineral from those seams which are most nearly vertical the cleavage is inclined both to the sides of the fissure and the direction of the fibers. However the basal plane is always horizontal, suggesting that gravity has played an important part in the orientation of the crystal network. From the imperfect cleavages of the brachypinacoid it is evident that the vertical seam, the fibers, are parallel to a brachy-dome. Some fairly good tabular crystals were obtained from the clay pit of the Fort Dodge Pressed Brick Company, where the mineral is associated with pyrite often filling the interior of sigillaria.

Gypsum. Crystals of gypsum occur in the coal measure shale in considerable perfection of form. So far as observed these crystals are invariably of tabular form parallel to the

*Geol. of Iowa, vol. 11, p. 305. 1870.

clino-pinacoid which with the unit prism and the positive hemipyramid are the only forms occurring on crystals found in this vicinity. The twin crystals are united along the ortho-prism. Shadow crystals are common both in simple and twinned forms. In the latter there is also an arrangement of impurities along the common axis of the two individuals from which barbs are thrown out in all directions. These prongs intersect with an approximate angle of 66 degrees which is found to correspond rather closely with the conical angle of the cone-in-cone structure common in the vicinity of Fort Dodge. The resemblance between the structures is very striking. Measurements of simple crystals show them to be commonly a trifle less than twice as long as broad, and their thickness something less than half their breadth. In twin crystals, however, the relative thickness is more than doubled, making each individual nearly as thick as broad. It will be noticed that the growth of these crystals is in one direction, and that they become smaller and smaller by frequent re-entrant angles into which fine clay has



Gypsum crystal from near Fort Dodge.

filtrated. With the rates of growth in the several directions as expressed above, it is evident that the angle receiving the foreign material is pushed upward approximately twice as fast as outward by reason of which the impurities are left in a cone whose angle is in the neighborhood of 60°. Only occasionally is one of those angles persistent, the majority of them being grown over and buried.

Peculiar growths are frequently observed where a small crystal protrudes from the prismatic face of a much larger individual. The faces of the prismatic zone of the small crystal are replaced by vicinal planes which come together in a point forming a sharp six-sided pyramid.

Cavities in the gypsum rock sometimes contain crystals of selenite, but the rock consists of fibrous gypsum, crystals being rare.