PSEUDO-CUBIC QUARTZ CRYSTALS FROM ARTESIA, NEW MEXICO

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Quartz crystals are among the most wide-spread of crystal forms, especially the hexagonal prism terminated by the two rhombohedral forms *r* and *z*. However, quartz crystals consisting dominantly of but one of the rhombohedral forms are rare and known from relatively few localities. This paper describes a new locality, near Artesia, New Mexico, where rhombohedral quartz crystals of large size are to be found. These crystals closely simulate cubes. They occur with other crystals of more common habit, and here, and in numerous other localities in southeastern New Mexico, where the common quartz crystals occur, they are known as "Pecos diamonds."

The senior author has observed that the initial form of some doubly terminated quartz crystals[1] occurring in gypsum near Acme, New Mexico (some 65 miles north of Artesia) was the plus rhombohedron. None of these crystals attained a size greater than 0.15 millimeter. From one of his associates, Mr. E. M. Hawtof of the Texas Bureau of Economic Geology, the junior author learned of the occurrence of great numbers of quartz crystals in gypsum near Artesia. He visited the area in March, 1928, the locality being along the last bluff on the Pecos river, five miles east of Artesia, New Mexico. The quartz crystals are most abundant along the bluff from the bridge over the Pecos river to a point some three miles south.

The gypsum beds in which they occur belong in the red beds of that region. They lie above the San Andreas formation and probably belong in the Chupadera group. The series consists of alternating beds of massive white gypsum and red sandy shale.

The crystals have weathered out of the gypsum, and, in some places, occur by the million; in others, are much less abundant. The crystals can be seen in place in numerous exposures along the bluff. They are in greatest abundance in a zone at the top of a

[1] Tarr, W. A. Doubly Terminated Quartz Crystals in Gypsum from Acme, New Mex. *Am. Mineral.*, **14**, 19–25, 1929.

gypsum bed and just below the red sandy shale. At one locality, some three miles below the bridge, the upper four inches of the gypsum bed is literally a mass of quartz crystals. They occur below this zone but are less abundant there.

The majority of the crystals are pink, red, or dark red, and the remainder (not to exceed 10 per cent) are white or colorless. The color of the crystals is, in large part at least, dependent upon the color of the gypsum. Those crystals occurring near the contact of the gypsum with the red shale are decidedly darker colored than those below. In one specimen of gypsum, a pink band extended across the specimen, evidently following a joint. Two quartz crystals had developed along this band; one, wholly within it, was pink; the other, only partly within it, was pink where it was in the colored band, and colorless where it lay outside it. Crystals in the white gypsum were not colored. In this case, the coloring material, hematite, had been introduced into the gypsum first and then the quartz was deposited. The irregular distribution of the color in the quartz is in keeping with its irregular distribution in the gypsum. In the occurrence near Acme, described by the senior author, the source of the hematite in the quartz crystals was the gypsum, into which it has been introduced from the overlying red members of the series.

The quartz crystals, as found on the surface and in place, are dominantly quartzoids or doubly terminated prisms, but among these there are a considerable number (possibly two per cent) of pseudo-cubic or rhombohedral forms (Figure 1). In a selected collection of crystals, the pseudo-cubic forms constitute nearly 20 per cent of the total collection. Radiating aggregates occur, but are not common. Quartzoids are especially common, and occur in all sizes up to four cm. in length, the average being about two cm. Some are perfect and others show a narrow zone of prismatic faces. The pseudo-cubic crystals are equidimensional, the largest being about one cm. across. The prismatic forms rarely exceed two cm. in length and are from six to eight mm. in thickness.

The rhombic or pseudo-cubic forms are of especial interest. The development of the plus rhombohedron *r* on crystals of one cm. in size, with the almost complete absence of the minus rhombohedron *z*, or at best with it only moderately developed, is rare. Crystals with the form *r* much larger than *z*, but singly terminated, are found, but they do not have the pseudo-cubic habit. This habit results from the fact that the angle between the faces of the rhombohedron *r* is 85° 46′, thus closely approaching a cubic form.

When the minus rhombohedron *z* is present, it modifies the corners of the plus form. The two faces differ in luster, the plus form being the most brilliant. Etching of the crystals revealed the fact that the distribution of the etch pits was not in strict conformity with the position usually obtained by etching, but

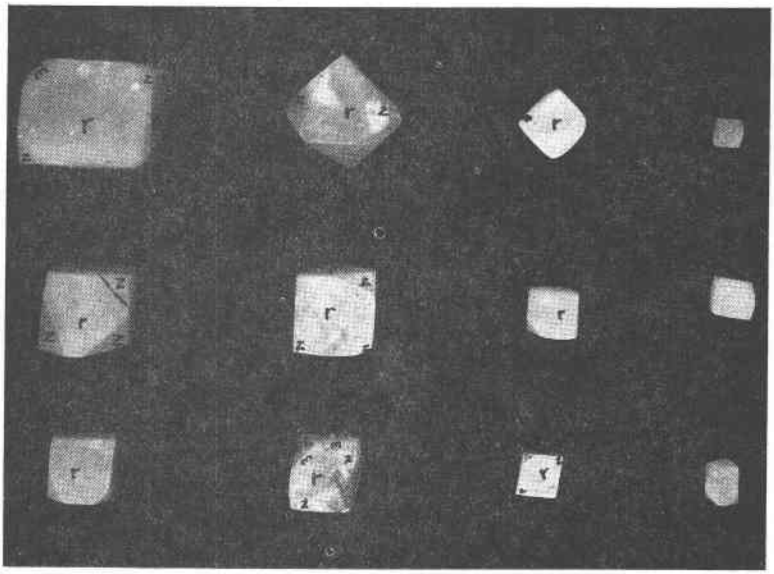

FIG. 1.

Pseudo-cubic Quartz Crystals. Natural size. Counting from the left, number 3 in the top row, numbers 2 and 4 in the second row, and 2 and 3 in the third row have been etched with hydrofluoric acid. *r* = plus rhombohedron, *z* = minus rhombohedron, *m* = prism.

instead, the pits were in bands that covered the surface irregularly. Definitely orientated etch pits, such as those secured on vein quartz, were not produced on these crystals.

In the senior author's paper on the quartz crystals found near Acme, the initial form was the plus rhombohedron *r*. When they attained a size of 0.15 mm. they began to develop the minus form *z* and soon become quartzoids. These large rhombohedral forms from Artesia indicate the presence of an inhibiting factor that prevented the development of the minus form. This factor was evidently of local distribution for the rhombohedral forms occur along with the other forms but in minor numbers.

What, then, could this inhibiting factor have been? The gypsum probably had no effect. Since the rhombohedral forms were colored by iron oxides just as the other forms were, the presence of the coloring matter was evidently not a factor. The concentration of the solution introducing the silica may have been a factor as well as its composition. An excess of one alkali over the other, or the presence of Mg ions (Mg ions are excellent coagulating agents for silica) might have influenced the development of the plus form or have inhibited the development of the minus form. It is also possible that the form assumed may be due to the character of the electrolyte, a strong positive electrolyte producing one form, and a weak positive electrolyte the other. The determination of the factors controlling the development of the two rhombohedrons offers an interesting field of investigation, but one beset with considerable difficulty for quartz is not readily precipitated as such, but rather as a gel.