NOTES AND NEWS

DETRITAL DIHEXAHEDRAL CRYSTALS OF QUARTZ IN A SEDIMENT IN UPPER MAGDALENA VALLEY OF COLOMBIA, SOUTH AMERICA*

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INTRODUCTION

Dihexahedral crystals of quartz were observed as a relatively abundant detrital component in a wide-spread sedimentary formation which occurs in the Upper Magdalena Valley of Colombia, South America. The occurrence merits attention because of its unusual character, the relative abundance of well developed crystals, the diagnostic possibilities of the quartzoids in making stratigraphic correlations, and the bearing of the mineral on the volcanic history of the Central Cordillera of the Colombian Andes.

LOCATION AND DISTRIBUTION

The dihexahedral crystals of quartz were first observed in a coarse, conglomeritic, loosely consolidated sandstone on the western margin of the Upper Magdalena Valley some 23 kilometers, by road, south of Ibague, Tolima, where the Coello River emerges from the rugged topography of the Cordillera Central and flows eastward in a deep canyon incised in the llanos, or plains, of Tolima (Fig. 1). The quartzoid-bearing conglomeritic sandstone caps the llanos in this area.

The crystals were observed also as a component of the "Guamo sand," which is used extensively as a construction material, and which occurs some 55 kilometers southeast of Ibague, in the vicinity of Guamo.

Likewise, the quartzoids occur in similar sands that form depositional terraces upstream along the Coello River, within the gorge that passes through the crystallines of the Cordillera Central. Further, spotty and patchy erosional remnants of the quartz-bearing sands were observed in the valley between Ibague and Ambalema.

These widely scattered occurrences of sediments containing the quartzoids suggest that they have, or at least once did have, a fairly extensive distribution, the details of which remain to be determined by future studies. Field and laboratory observations upon which this article are based were made in May 1938 during the course of investigations for the Departamento de Petróleos, Ministerio de Industrias y Trabajo, of the Colombian Government.

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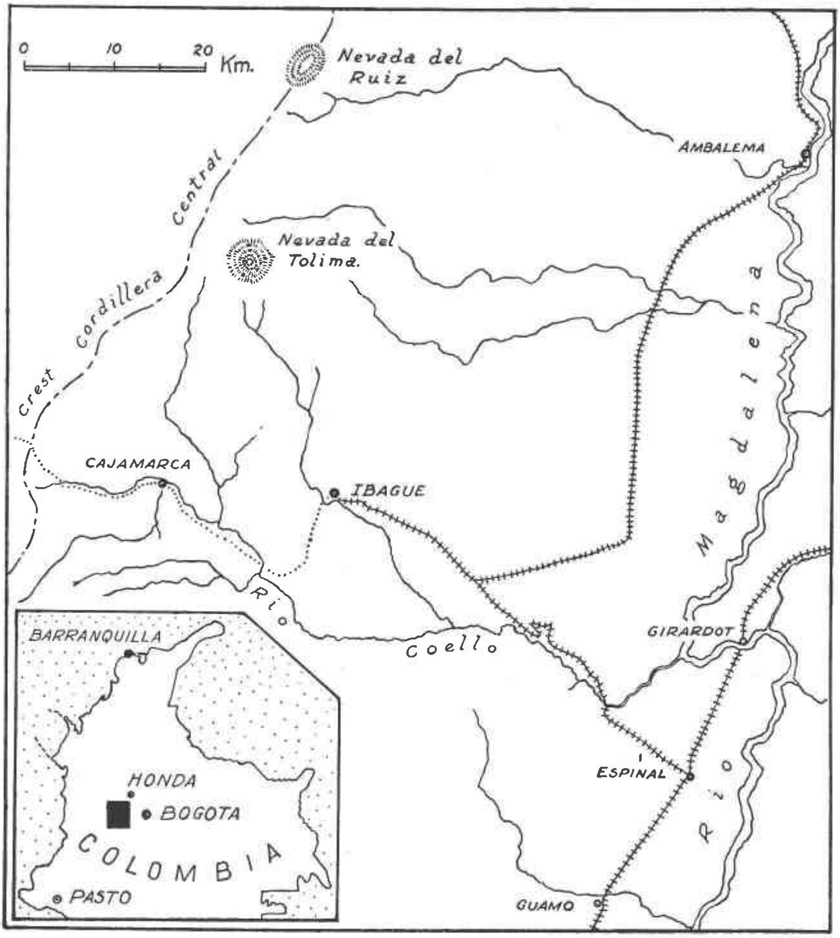

FIG. 1. Location map.

DESCRIPTION

The quartz of the dihexahedral crystals found in the Magdalena Valley is a colorless, transparent variety (Fig. 2-A). The identity of the mineral was checked in the Laboratorio de Minas y Petróleos, Bogotá, and the mineral showed properties in agreement with published data on quartz. Many crystals have perfect dihexahedral forms, r $(10\bar{1}1)$ and z $(01\bar{1}1)$ being equally developed, but some distortion is common. Well formed quartzoids range in length between 0.5 mm. and 5.0 mm.

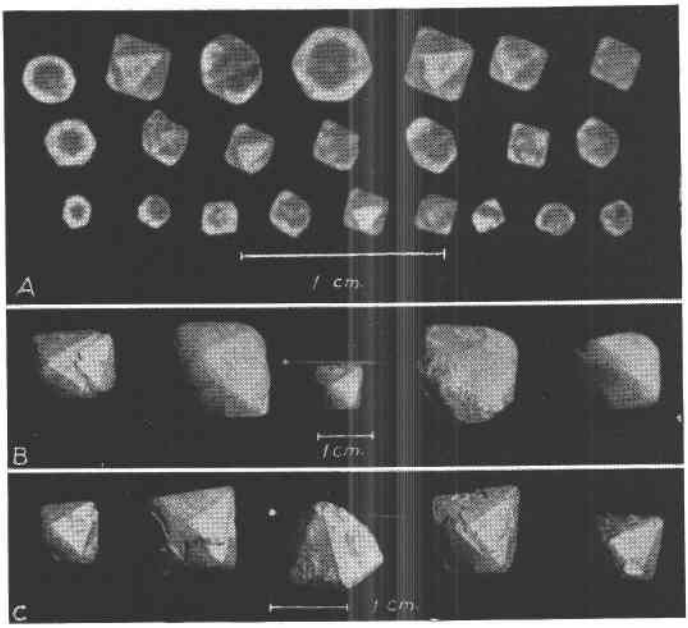

FIG. 2-A. Detrital dihexahedral crystals of quartz collected from the top of the Mesa formation near the Coello River.

FIG. 2-B, C. Larger dihexahedral crystals of quartz collected from along the Coello River in the Cordillera Central near Cajamarca. Most of the crystals illustrated are placed so that the *c*-axis slopes upward from left to right. Parallel grouping is well shown in many of the larger crystals.

Note how abrasion has rounded the apices of some of the larger crystals in Fig. 2-B. Short prism faces occur in the first and third crystals from the left in Fig. 2-C.

Many crystals have sharp edges to the crystal faces. Some crystals are broken, but only the largest ones show any tendency to be rounded as a result of transportation. When rounding is present it is best developed at, or restricted to, the apices of the pyramids. Some of the crystals have indentations and embayments characteristic of mutual penetration with neighboring minerals during growth in a magma.

Quartzoids larger than those found in the Magdalena Valley occur in terraces in the upper reaches of the Coello River far within the Cordillera Central. These range in size up to 2 cm. from apex to apex (Fig. 2-B, C). In some places near the town of Cajamarca (San Miguel), Tolima, they are plentiful enough to be sought out by the boys to shoot in their sling shots. These larger crystals are translucent and cloudy in contrast to the clear glassy character of the smaller ones described above. Much of the cloudy appearance is due to internal flaws. The larger quartzoids are usually badly distorted and may be quite rounded at their apices due to abrasion during transportation. Indentations characteristic of corrosion or mutual penetration with other minerals are present in many specimens and parallel grouping is common. Short prism faces, *m* $(10\bar{1}0)$, are present on some crystals.

Occurrence

Dihexahedral crystals of quartz are known throughout the literature to be of igneous origin and their expectable occurrence is in dacitic and

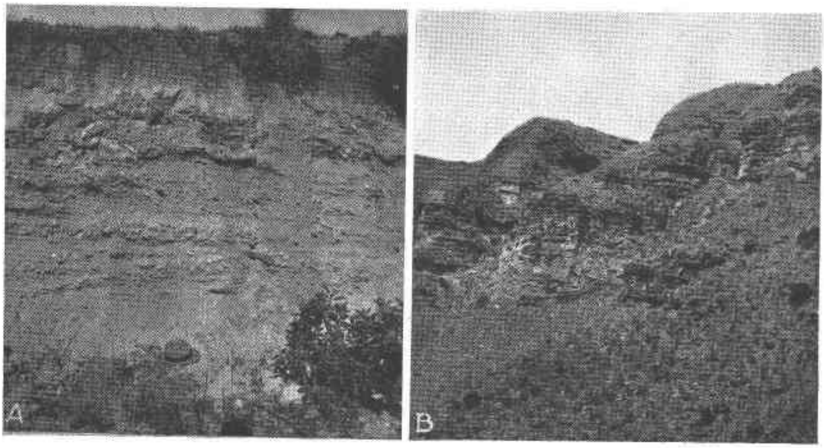

Fig. 3-A. A typical outcrop from which small dihexahedral crystals were collected.
Fig. 3-B. Typical bluff of the Mesa formation.

rhyolitic types of rocks. Although quartz-bearing sands are common, the occurrence of well formed quartzoids as a relatively abundant detrital component of a sediment is unusual and warrants attention; the writer is not aware of previous notice of such an occurrence.

The quartz crystals occur in a coarse, conglomeritic, loosely consolidated sandstone (Fig. 3-A) whose fragments consist chiefly of quartz, feldspar, ferromagnesian minerals, and andesitic and dacitic rock fragments. Pieces of pumaceous lavas, plutonic and metamorphic rocks are also present. The associated single mineral grains include feldspar, mostly of andesine variety, hornblende, pyroxene, biotite and magnetite; good euhedral forms are common, and the pyriboles occur in much smaller sizes than the lighter minerals. Bedding is well defined, especially on weathered slopes.

Where first observed, the quartzoid-bearing sandstone caps the "llanos deposit," or Mesa formation, which comprises ash, pyroclastics and mixed sediments, mostly water-worked, that aggregate a thickness of over 500 feet in this locality, but exceed 1,000 feet in thickness near Honda, Tolima. The Mesa formation (Fig. 3-B) is essentially an alluvial plain deposit built up by intersecting alluvial fans that were deposited from the Cordillera Central. The age of the formation has been variously stated as ranging from Pliocene to Recent. The formation was deposited after folding, faulting and erosion of an appreciable thickness of Miocene strata, for which reason the writer considers it to be latest Pliocene or earlier Pleistocene in age.

Origin

The dihexahedral quartz crystals obviously are of igneous origin, having been developed under intratelluric conditions, and quartzoid-bearing rocks have been described from the general region. Hettner and Linck[1] described boulders from the Honda district that were pyroxene-bearing amphibole andesite containing dihexahedral quartz crystals; the boulders were transported from the Cordillera Central.

Küch[2] described quartzoids in pyroxene-amphibole dacite from the Mesa Nevada de Hervo (Paramo de Ruiz), and from a boulder of agglomerate of biotite, amphibole-dacite which he collected from the Coello River near Ibague. He also described dacites in which dihexahedral crystals of quartz occur from localities south of the drainage basin of the Rio Coello, especially in the vicinity of Tuquerres near Pasto.

Lehmann[3] noted the occurrence of dihexahedral quartz crystals in a quartz-monzonite from west of Coyaima, Tolima.

The striking fact that many of the crystals are not appreciably rounded by abrasion suggests, with due allowance for the hardness of the mineral, that they have undergone little transportation by water. It seems likely that many of the crystals were brought to the earth's surface and scattered by a more or less explosive type of volcanism, during which they were shaken loose from the magma along with other already formed crystals. This means of liberation of minerals is known to have taken place in other volcanic regions. The presence of pumaceous

[1] Hettner, A., and Linck, G., Beitrage zur Geologie und Petrographie der Columbianischen Anden, p. 200 (1888).

[2] Küch, R., Petrographie 1. Die volkanischen Gesteine in Geologische Studien in der Republik Colombia. Reiss, W., und Stübel, A., Reisen in Sud-Amerika. Berlin, verlag von A. Asher & Co. p. 91 (1892).

[3] Lehmann, E., Beitrage zur Petrographie des Gebietes am obern Rio Magdalena: *Tschermak's Min. und Pet. Mitteil.*, 260 (1911).

fragments of lava and free fragments of feldspars and pyriboles in the sediment support this hypothesis.

In addition, important quantities of the quartzoids were subsequently liberated from their parent rocks by the usual processes of weathering, disintegration and fluvial erosion.

Stratigraphic Significance

To date the dihexahedral quartz has been observed in abundance only at the top of the Mesa formation. In places the Mesa formation appears quite similar lithologically to the tuffaceous facies at the upper part of the underlying Miocene Honda series. As far as the writer's brief observations go, the two formations, when lithologically similar, may be differentiated in places by the presence of abundant small quartzoids in the younger Mesa formation. One purpose of this article is to call attention to the stratigraphic significance of the presence of the crystals in the hope that future investigations may include detailed study of the distribution of the quartzoids throughout the stratigraphic section and check their value as a field criterion for differentiating between the Mesa formation and the Honda series in the upper Magdalena Valley.

The presence of quartzoids offers a means of dating sediments in the upper Magdalena Valley with and after the time of eruption of the parent andesitic and dacitic lavas in the Cordillera Central. Unfortunately, little detailed information is available as yet concerning the distribution of these lavas in Colombia, or of their place in the geological history of this region.

Summary and Conclusions

Small dihexahedral crystals of quartz occur as a relatively abundant detrital component in a widespread sedimentary formation in the Upper Magdalena Valley of Colombia, South America. Such an occurrence in itself is unusual, and it especially merits attention in this instance because of the abundance of well developed crystals present. The quartzoid-bearing sediment lies at the top of the Mesa formation which is thought to be latest Pliocene or earliest Pleistocene in age.

The quartzoids are considered to be of igneous origin, developed essentially under intratelluric conditions. They were liberated for accumulation in the sediment during the course of explosive volcanic eruptions and the subsequent weathering and disintegration of the parent andesitic and dacitic lavas which occur in the Cordillera Central of the Colombian Andes.

Brief observations made to date suggest that the presence of the quartzoids may offer a means of differentiating stratigraphically between the Mesa formation and the lithologically similar upper part of the Miocene Honda series; these observations require further checking.

Finally, the presence of the mineral provides a possibility of correlating the quartzoid-bearing andesitic-dacitic periods of volcanism of the Cordillera Central of the Colombian Andes with the sedimentary rocks of the Upper Magdalena Valley.

ICELAND SPAR IN TAOS COUNTY, NEW MEXICO

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Recently a commercial deposit of Iceland spar has been opened in New Mexico. Since such deposits are very rare and seldom last very long it seems desirable that a description of it be recorded.

Location. The deposit, officially known as the Iceberg Lode Mining Claim, is located in Sec. 31, T. 23 N., R. 11 E., Taos County, New Mexico, at the southern end of the old Copper Mountain Mining district, not far from the old Lithia deposits of Harding. It is about 30 miles south-southwest of Taos by road and approximately 55 miles north-northeast of Santa Fe. The operators are Messrs. E. M. Stanton and J. W. McCoy of Santa Fe, New Mexico.

Geology. The deposit occurs in pre-Cambrian rocks, mica schists and quartz mica schists. It occupies a tubular or conical space nearly circular in horizontal section along a fault plane. At the surface the deposit is approximately 20 feet in diameter. As of August, 1939, the workings had penetrated to a depth of from 20 to 25 feet along the southwestern side of the deposit. From the excavation it would appear that the deposit is plunging slightly to the south or southwest. The calcite appears to occupy a former cavity in the schist. It has clean-cut boundaries. The schist around the borders is altered to a clayey material. The calcite has developed as a mass of intergrown crystals of large size which completely fill the space and form a solid mass of the mineral. The surface and near surface portions of the deposit which were visible at the time of visit were discolored, more or less opaque, badly flawed, intergrown, and in some cases twinned, and were not suitable for optical use. Around the borders crystals of calcite up to $1\frac{1}{2}$ feet across grew out into the clayey decomposed schist. To date these have supplied all of the material marketed. The outer surfaces of most of these crystals are etched and coated with clayey material. The high grade material gives a clear ringing sound when struck, quite different from the dull thud of a badly flawed piece.