GEODES

Geodes are discrete bodies of mineral matter with various shapes, but commonly they are globular or ellipsoidal. They are formed by the inward growth of mineral matter upon the walls of cavities in rock. Usually geodes are hollow, but may be solid if the process of inward growth of crystals has been carried to completion. This manner of growth distinguishes geodes from nodules or concretions which grow outward from a nucleus.

Geodes possess relatively solid siliceous or calcareous shells which are more resistant to weathering than the enclosing rock, so that upon weathering the mineral mass will be freed as a discrete entity, a geode. Not all crystal-lined openings in rocks can be called geodes. Vugs, for example, are inseparable from the enclosing rock--they have no shell.

Geodes have a wide stratigraphic and geographic range and are found, for example, in the Pacific Northwest, New York, Wyoming, Kansas, the Bad Lands of South Dakota, and England; but perhaps the most famous geode region is that around Keokuk, Iowa. Here the geodes are found in the shales of the lower Warsaw Formation and the argillaceous dolomites of the upper Keokuk Formation which belong to the Mississippian System. In the outcrop area specimens freed by weathering are so abundant as to literally pave some stream beds.

Geodes and fossils seldom occur together in the same layer. In the Keokuk locality geodes are concentrated in zones or layers of shale or shaly dolomite which are commonly separated by zones of limestone or dolomite containing many fossils but no geodes.

The geodes range in size in the long dimension from less than 0.1 inch to over 36 inches, but the average size range is about 2 to 6 inches. Large and small geodes are not found associated in any given layer, but there may be considerable range in size at different levels in the same exposure.

An outstanding feature of the geodes is the outer shell which is usually composed of chalcedony, commonly with an outer film of clay. The shell varies in thickness from a mere film to over an inch, but the thickness of the shell is not related to the size of the geode. The outer surface of the shell is rough and pitted. The shell is usually quite distinct from the layers of crystals on the interior, as well as from the enclosing bedrock because of the difference in composition.

The most abundant mineral of the geodes from the Keokuk area is quartz. The commonly observed color of the quartz crystals is milky-white, although some clear crystals are often present. Various shades of red, brown, yellow, black and light green discolorations of the quartz are due to different oxidation stages of included iron compounds.

Although chalcedony is the primary constituent of the shells, it occurs within the geode cavity as well, and assumes various shapes. The color is commonly pale blue to blue-gray.

Calcite displays more variations than any other inclusion. This mineral is most commonly found as isolated crystals or crystal aggregates on quartz, but in some instances calcite lines the shell. The most common forms of calcite crystals are the

rhombohedron, the scalenohedron, and the scalenohedron modified by the rhombohedron. Crystals of metallic sulfides are sometimes found in association with the calcite.

Exotic minerals are occasionally found in geodes. Other minerals frequently found include dolomite, ankerite, barite, magnetite, hematite, pyrite, chalcopyrite, sphalerite, limonite, smithsonite, malachite, kaolin, gypsum, water and bitumen.

References

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