

SILICA GEL AND WARSAW GEODES

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At the 1940 meeting of the Illinois State Academy of Science it was suggested that geodes such as occur in the Warsaw formation might have been formed from rounded masses of colloidal silica deposited on the sea bottom at the same time the sediment was being laid down.¹ It has been experimentally determined that globular masses of hydrous silica gel may be produced by letting a sodium silicate solution of from 1.17 to 1.38 specific gravity flow into a solution containing from about 16 to 26 percent commercial sodium chloride, and giving a rocking motion to the container. More dilute solutions of sodium silicate and more dilute solutions of salt produce flocculant masses of silica of indefinite shape but they do not generally produce rounded masses of silica gel. While such spherical masses can be produced by rocking alone, they can be molded by hand more rapidly.

When these masses of hydrous silica gel are removed from the solution they assume an oblate form and on slowly drying they shrink but slightly, and eventually leave a hollow shell of silica gel. When, to simulate natural conditions more closely, the spherical mass is placed in wet mud and dried slowly, a similar result has been obtained, namely a hollow shell of silica gel.

There is no intention to intimate that geodes have been formed by identical methods. There is no evidence known to the writer that so-

dium silicate in concentration even approaching those used ever may have been carried into the sea. But there are two points that seem to be of significance in the experiments. First, masses of silica gel can be produced in an ordinary salt solution when the salt is at concentration frequently found in salt lakes although not at the concentration usually found in the ocean. In this regard it may or may not be significant as Van Tuyl pointed out regarding the Warsaw formation: "that the member where it bears no geodes is in most cases, although not in all, fossiliferous, while the geodiferous phase is, except for occasional limited seams of limestone, nearly destitute of fossil remains."² Second, when the somewhat spherical mass of hydrous silica gel is permitted to dry slowly a hollow shell of silica gel results.

In nature twin geodes are occasionally found. These consist of two (rarely more) chalcedony shells in contact, the surface of contact being essentially flat. One twin may be directly above the other when found in situ or they may lie side by side. Sometimes a thin film of kaolinite or some similar mineral separates the two shells. Each shell has developed its own individual cavity and they are not connected with each other. It has been very difficult to see how any process of solution and subsequent deposition of silica could account for such a phenomenon. It has

¹ Robertson, Additional notes on the Geodes of the Warsaw Formation, Trans. Ill. Acad. Sci. vol. 33, p. 168 (1940)

² Van Tuyl, Iowa Geological Survey, Annual Reports, 1921 and 1922, vol. XXX, p. 312.

been possible in the laboratory to produce two shells of silica gel in contact and each with its own separate cavity.

Mr. Walter Weiler carried out some of the experimental work here presented and appreciation is due him.