DETRITAL COLLOPHANE

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A few years ago Professor A. F. Rogers[1] wrote a paper entitled "Collophane, a Much Neglected Mineral," showing that collophane deserved recognition as a valid mineral species, and that considering it as an appendix to apatite was unjustified and the attention devoted to it was inadequate. Collophane is well known as the principal mineral of many of the economically valuable phosphate deposits, as well as in nodules, concretions, etc., in various sediments in which it is not concentrated enough to be of any commercial value. It has long been recognized that in the land and river pebble phosphate deposits of Florida,[2] and in the river phosphate deposits of South Carolina,[3] the phosphate pebbles and grains were mostly derived from an older formation, a phosphatic marl, in which the collophane was presumably an authigenic constituent. *Detrital* collophane, outside of the workable pebble phosphate deposits, does not appear to have received much notice. Cayeux[4] described the different modes of occurrence of phosphate of lime in sediments, but made definite mention of a detrital origin only in the case of apatite. Milner[5] mentions briefly some of the occurrences of detrital collophane described in this paper.

The purpose of the present note is to describe collophane as it occurs in sand grains and to point out the fairly wide distribution of collophane in this form, especially in the coastal plain deposits of the southeastern states.

Collophane sand grains are generally well rounded and have smooth polished surfaces. The size of the grains varies from a few hundredths of a millimeter upward, and naturally varies with the coarseness of the sand in which they occur. The color is brown, gray or black by reflected light. According to A. F. Rogers[6] the specific gravity of collophane is from 2.6 to 2.9, the hardness from 3 to 5, and the index of refraction from about 1.57 to 1.63. The higher figure for specific gravity applies more nearly to the collophane

[1] *Am. Journ. of Science*, 5th series, vol. **3**, pp. 269–276, 1922.

[2] Sellards, E. H., *Florida State Geological Survey*, 7th Annual Report, pp. 25–116, **1915.**

[3] Rogers, G. S., *U. S. G. S.*, Bull. **580**, pp. 183–220, 1915.

[4] Cayeux, Lucien, Etude Petrographique des Roches Sedimentaire, pp. 234–241.

[5] Milner, H. B., Sedimentary Petrography, Second Edition, **1929**, p. 260.

[6] *Am. Journ. of Science*, 5th series, vol. **3**, p. 275, 1922.

occurring in sand studied by the writer, since most of the collophane grains sink in bromoform of specific gravity 2.85. Under the microscope, by transmitted light, the color is yellow to brown. The coloring matter is not uniformly distributed, and a large proportion of it, if not all, is in the form of small dark inclusions which are probably some kind of carbonaceous material. These frequently render the centers of the grains nearly opaque. Small inclusions of calcite and somewhat larger ones of quartz were noticed in a few instances but do not seem to be common.

Collophane in small grains is optically isotropic. Collophane grains in beach sand from one locality on South Carolina, two in Georgia, and three in Florida all have their refractive indices between 1.600 and 1.615. Considering the amorphous nature of the mineral its index seems very uniform, although it is likely that the examination of a larger number of grains and material from more localities would show a greater variation.

Collophane does not closely resemble any other mineral likely to occur in sands, but as an additional check qualitative chemical tests for phosphate were made on a few selected grains, and these tests gave positive results. On account of its easy solubility collophane is not found in sands which have been treated with acid.

The known occurrences of collophane in the beach sand of the Atlantic coast extend from Charleston, South Carolina, south to Miami, Florida. The approximate localities at which sands containing collophane were collected are as follows:

South Carolina	Georgia	Florida
Folly Beach, near Charleston	Tybee	Amelia Island
	St. Simon Island	Mineral City
		St. Augustine
		Daytona Beach
		Indialantic Beach
		Hollywood
		Miami

It is probable that collophane occurs at all of the intervening localities along this coastal beach since it was not found to be absent from any of the samples in which search was made for it. The actual proportion of collophane present, referred to the whole sand, is not very great, but it may make up as much as ten percent of the heavy minerals separated by bromoform. The amount is greatest near Charleston, somewhat less near Jacksonville, Florida, and becomes very small indeed on the east coast of southern Florida.

For a few miles on the southwest coast of Florida collophane is one of the principal minerals in the beach sand. At Venice the sand is nearly black from the abundance of dark grains of this mineral, which are derived from a sandy phosphatic limestone or limy sandstone outcropping at this locality. A grain count on a sample in which the heavy minerals had been somewhat concentrated by wave action gave: quartz 41.5%, collophane 36.0%, shell fragments 2.3%, with various heavy minerals making up the remainder.

Detrital collophane, as pebbles and grains, occurs in recent alluvial deposits in the rivers and smaller streams at many localities in various parts of Florida and around Charleston, South Carolina.[7] It is by no means limited to deposits which have been worked for river pebble phosphate, but is much more widespread in its occurrence. The above mentioned land pebble phosphates of Florida contain collophane, which is principally of detrital origin, as the valuable mineral, and rolled grains and pebbles of collophane occur frequently in Florida in other Pliocene and Pleistocene sediments in which the percentage of phosphate is too low, or on which the overburden is too great for them to be worked as phosphate rock.

G. M. Ponton[8] of the Florida State Geological Survey, reports that collophane, apparently detrital, occurs in well samples of the later Tertiary formations from many localities in Florida.

Phosphatic marl of Miocene age is the original source of the detrital phosphate grains in South Carolina, Georgia and Florida. The phosphate-bearing formation is known as the Edisto marl in South Carolina[9] and the Hawthorn formation in Florida.[10] The immediate source of some of the collophane in recent deposits is Pliocene and Pleistocene sediments containing collophane which had previously been derived from the Miocene phosphatic marl.

Considering its softness and comparatively easy solubility, it is not to be supposed that collophane in appreciable quantity could survive either transportation over a long distance or weathering through a long period of time, but as shown by the occurrences in the southeastern states, it may occur rather abundantly as a detrital mineral where source beds are near at hand and weathering has not been too thorough.

[7] Rogers, G. S., *U. S. G. S.*, Bull. **580**, pp. 183–220, 1915.

[8] Personal communication, Aug. 29, 1931.

[9] Rogers, G. S., *U. S. G. S.*, Bull. **580**, pp. 183–22220, 1915.

[10] Cooke, C. Wythe and Mossom, Stuart, *Florida State Geological Survey*, 20th Annual Rept., pp. 115–137, **1929.**