

TALC FROM CENTRAL GULF COAST
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INTRODUCTION

Occurrence.—Talc was found to be a minor, but widespread, mineral in Miocene clastic sediments in the central Gulf Coast and was found in sediments examined from Florida, Alabama, and Mississippi. Though previously unreported in other than recent sediments from this area, talc was found locally to form a significant portion of the clay mineral or fine silt fraction of some sediments. At two of the four localities where the mineral was found, it occurred in the clay fraction of lower Miocene, non-marine, fluvial, and lagoonal sediments (locations A-1 and A-2, Fig. 1); at location F-1, talc was present in the clay fraction of middle Miocene marine clays and at location M-1 it was found to be a constituent in the fine silt fraction of lower Miocene marine clays.

The mineral is undoubtedly more common than would seem from a search of the literature, but its presence is often masked by the proximity of its 001 peak (9.4 Å) to that of the more abundant mineral illite, whose 001 peak occurs at 10 Å. Also, because the presence of talc is not usually expected, it may be overlooked as a spurious minor reflection when it occurs in small amounts. Analyses also indicate that talc is usually restricted to the clay or fine silt fraction of coarse clastic sediments that have little minus 62 μm material. Consequently, the clay mineral portion of such sediments is often ignored in routine analyses and any talc present would go unnoticed. It has been observed in modern sediments, however, and Griffin (1963) reported that it is common in the minus 2 μm fraction of beach sands of the northeastern Gulf of Mexico.

Laboratory Analysis.—X-ray diffraction analyses of samples from the locations in Figure 1 were run for the minus 2 μm fraction, the 2–20 μm fraction and for the 20–44 μm interval. For each of the preceding size intervals, analyses were run for glycerated samples and for samples heated to 300°C, 500°C, 800°C, and 900°C. Talc was identified by its characteristic 9.34, 3.12, and 4.66 Å peaks that were unaffected by glyceration and by heating to 700°C. To insure that the mineral was not actually pyrophyllite, which is similar in appearance and thermal behavior, talc was identified by the larger d_{006} spacing at 3.12 Å rather than at 3.06 Å, as is the case for pyrophyllite. A more extensive discussion of the thermal behavior and crystal chemistry may be found in Deer, Howie, and Zussman (1962).

At location F-1, talc was found in the greatest abundance and made up approximately 10 percent of the –2 μm fraction. Diffractograms from this location associated with chlorite, montmorillonite, palygorskite (attapulgite), and sepiolite clays. When heated to 300°C the montmorillonite clays are seen to collapse to approximately 10 angstroms whereas the talc, chlorite, palygorskite, and sepiolite were unaffected. Heating to 500°C

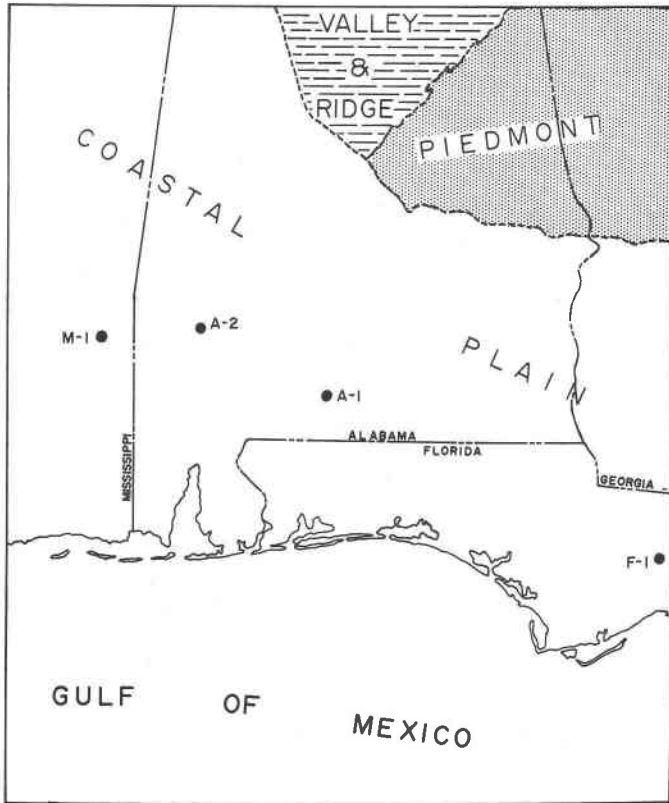


FIG. 1. Index map showing sample localities

destroyed the palygorskite and sepiolite but did not affect the talc or chlorite. Samples heated to 800°C for 2 hours show complete destruction of the chlorite and a reduced amount of talc. In addition, this sample also shows the first appearance of the thermal decomposition product of talc which Eitel and Kedesdy (1953) believe is protoenstatite. The final destruction of talc was completed when the sample was heated for two hours at 900°C at which time all talc was converted to protoenstatite(?). Similar results were noted when samples A-1, A-2, and M-1 were heated.

ORIGIN

Discussion.—Talc at location F-1 was found in only one 2-foot interval in an 8-foot exposure of highly fossiliferous clays of the middle Miocene Chipola Formation. The presence of talc at this location associated with palygorskite and sepiolite might possibly suggest that it was the result of diagenetic alteration of these magnesium-rich clays. Füchtbauer and Goldschmidt (1963) have noted that talc is more frequent in older rocks whereas sepiolite and palygorskite are more common in younger rocks and suggest that, possibly, palygorskite-sepiolite clays may alter to talc.

Mueller (1967), however, believes that this origin for talc, if possible, would only take place following moderate depths of burial (approximately 500 meters). If this is correct, it would make unlikely any such origin for the talc at this location because the Florida Miocene sediments have been buried, at most, to depths of 100 meters or so. Füchtbauer and Goldschmidt (1959) in an earlier paper report the presence of talc in anhydritic rocks of the Zechstein evaporite sequence and believe that here the mineral has formed by magnesium-enriched sea waters reacting with silica gels to form primary talc. The presence of abundant fossils throughout the exposure at location F-1, coupled with the lack of other minerals indicative of a hypersaline environment, strongly indicates that the talc present is not the product of primary precipitation. In light of this information, and lacking any other plausible explanation, the talc at location F-1 is interpreted as detrital in origin.

Similarly, at location M-1, the talc is restricted to only one unit within a 15-foot outcrop of lower Miocene Catahoula Sand. The unit containing the talc is approximately three feet thick and consists of medium to fine sand with less than 5 percent $-62 \mu\text{m}$ material. The remainder of the exposure consists of grey, mottled, oxidized clays that were not found to have any discernible talc and consisted chiefly of illite and kaolinite. The talc present was found in the fine silt fraction and is also believed to be detrital in origin. This is supported by the fact that none was found in the $-2 \mu\text{m}$ portion and because the other clay minerals present at this location indicate no unusually high amounts of silica and magnesium being supplied to the sea water or any conditions of high salinity. Again, these conditions are believed by Füchtbauer and Goldschmidt (1959) to be necessary for talc to form in a marine environment by primary crystallization.

Talc at location A-2 is restricted to the clay fraction of only one unit in a five foot exposure of grey, organic-rich sandy clays. These sediments are part of the lower Miocene Catahoula Sand and are believed to have been deposited in a lagoonal or estuarine environment. Again, a detrital origin for the talc present is most likely.

At location A-1, talc was found to be an abundant constituent of the clay fraction of almost all units in a 15-foot exposure of un-named basal Miocene sands. Here the sediments consist of cross-bedded, fine to coarse sands with thin layers of tan, plastic, kaolinitic clay that were deposited in a fluvial or deltaic environment. Talc was present in the small clay fractions of most of the sand units but was not found in the clay lenses themselves. Because the clay fraction of all the talc-bearing units amounted to less than 1 percent of the total sample weight, concentration of the mineral appears to have been favored by higher energy depositional environments and is, undoubtedly, of detrital origin. The

mineral talc appears to be a widespread component in both recent and ancient sediments but is often overlooked because of its presence in trace amounts. Its occurrence in Miocene-age sediments is similar to that in modern sediments in that it appears to be most common in high energy depositional environments, such as beach sands and fluvial sediments but is, by no means, restricted to these. Griffin (1963) notes that in the recent sediments of the northeastern Gulf of Mexico talc is most common in beach sands where little clastic material is being added and where the beach sediments are composed mainly of reworked Pleistocene sands. Probably, it is present in small amounts in clays deposited on the Continental Shelf, further from shore, but its presence is masked by other more abundant clay minerals. It does appear, however, to behave hydraulically as a much larger mineral and is most concentrated in the higher energy environments. Griffin (1963) did not comment as to the ultimate origin of the talc in the northeastern Gulf sands, but, as with the talc found in the Miocene sediments, there is little doubt that it is detrital in origin. Though not previously reported as a detrital constituent of recent or ancient sediments in the United States, several references to detrital talc in other countries are found in Milner (1962). Locations where the mineral has been observed include the lower Cambrian sandstones of Poland, Cretaceous to Miocene sediments of Saskatchewan, Canada, Miocene sands of Italy, and in recent sands at Bahia, Brazil.

The obvious source of the talc present in Miocene and Recent sediments of the central Gulf region are the Paleozoic rocks of the Georgia and Alabama Piedmont. Talc has been mined from Cambrian marbles in Georgia for many years and is presently mined at several locations in eastern Alabama. Major rivers originate, or pass through, both of these areas now, and probably did so during the Miocene, and are the agents responsible for transporting the mineral to the Gulf of Mexico.

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