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The Occurrence of Polyframboidal Pyrite in a Beach Sand Deposit, Cox's Bazar, Bangladesh

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Abstract

The heavy mineral fraction of Cox's Bazar beach sand contains framboidal pyrite ranging from 0.074 to 0.105 mm in diameter. The magnetic susceptibility of the grains is 35×10^{-6} e.m.u., and the extraction range with a Frantz isodynamic separator is 0.4 to 0.6 amperes. Each framboid consists of a host of minute globules of pyrite; thus a long distance of sedimentary transportation seems unlikely. Deltaic sediments immediately behind the coastal deposit may represent a possible source of the pyrite. Alternatively, it may form in swamp sediments interlocked between sand dunes, with the organic or inorganic metal sulfides thus precipitated being transferred to the beach by a tidal bore.

Introduction

The beach sands of part of the southern coastline of Bangladesh (Fig. 1., formerly East Pakistan) contain a potentially economic concentration of "heavy minerals." The main locality is Cox's Bazar, 100 km south of Chittagong, where magnetite, titano-magnetite, hematite, titano-hematite, zircon, ilmenite, rutile, and leucoxene are prominent in an essentially siliceous sand. During a mineragraphic study pyritic grains of polyframboidal texture have been recognized in polished sections of heavy concentrates. The framboidal texture of the pyrite is similar to that described by Love (1957, 1971) in a wide variety of sedimentary lithologies of different ages. Although characteristic of many modern sediments, framboids have also been reported from volcanic and possibly from hydrothermal environments (Rickard, 1970).

Method of Study

A small amount of mineral concentrate is mixed into a relatively fluid portion of cold setting plastic, the fluidity of the plastic allowing the heavies to sink towards the base of the circular stainless steel mold.

When this initial portion begins to harden, the mold is filled with less fluid plastic to the required depth. Polishing is carried out in the usual manner, initially by hand grinding so as to cut into the crop of heavies embedded near the surface of the section. Final polishing is then achieved by means of a syntron vibrating polishing machine.

Nature and Origin of the Pyritic Sand

The pyritic grains are in the finer fractions of the sand, their diameters ranging from 0.074 to 0.105 mm. The grains have a magnetic susceptibility of 35×10^{-6} e.m.u. and the extraction range in a Frantz-Isodynamic separator is 0.4 to 0.6 amperes.

In reflected light the grains are seen to be aggregates of spherical to ovoid bodies (Fig. 2) in colonial arrangement. Each body consists of a host of minute globules of pyrite. The few associated pyrite euhedra that occur within the grain (Fig. 2a) may have formed by direct precipitation of FeS_2.

Associated with the ovoid bodies, in most instances, are numerous polygonal pyrite grains (Fig. 2a), which appear to be crystals, and circular grains, whose nature is uncertain.

The source of these pyritic grains is not clear, but it is unlikely that they would survive a long distance of sedimentary transportation. From a consideration of the Cox's Bazar area, it seems likely that the deltaic sediments immediately behind the coastal deposits are a possible source. Another source may be the swamps or low-lying marshy areas which are occasionally interlocked between the sand dunes of the coastal plain, especially in the back-dune areas of the present-day beach profile. These swamps may be ideal places for the formation of organic or in-

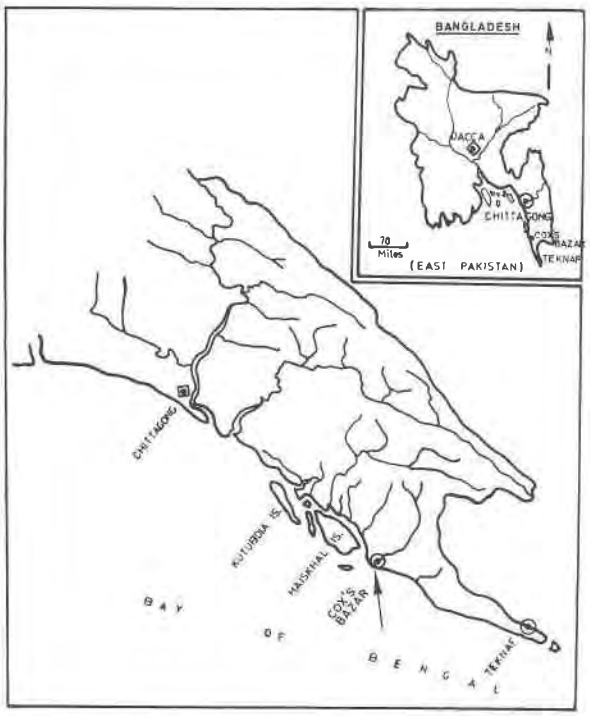

FIG. 1. Sketch map of Bangladesh (E. Pakistan) with southern coastal plain and offshore islands. Arrow shows location of material investigated.

organic metal sulfides such as pyrite which, when formed, may be transferred to the beach by a tidal bore.

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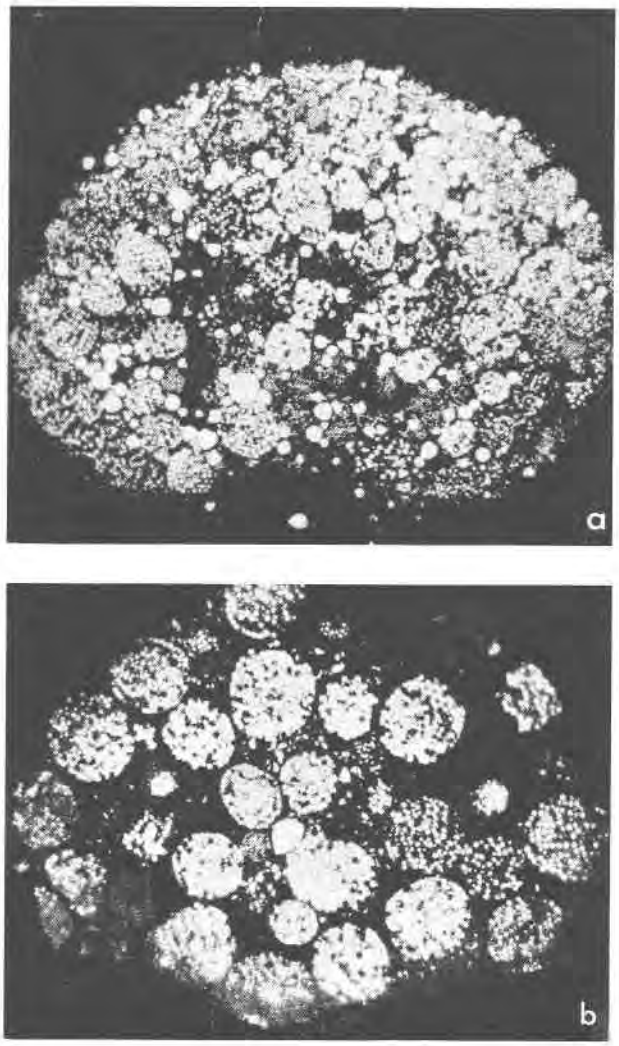

FIG. 2. Polyframboidal pyrite grain, Cox's Bazar, Bangladesh. **A.** Spherical framboids associated with polygonal and spherical pyrite grains. The higher magnification of **B** shows the detail structure of the framboids. Magnification, **A,** ×400; **B,** ×640.

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