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Agglutinated foraminifera using coccoliths as building material: Grain handling and wall structure

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Scanning electron microscopy of foraminifera from the lowermost Barremian (Lower Cretaceous) deposits at Speeton, eastern England, reveals that about 4% of the agglutinated tests >36 µm are constructed almost exclusively of coccoliths of the species *Watznaueria barnesae*. This species makes up about 5% of the total number of the grains <36 µm available for the agglutinated fauna. The majority of the foraminifera utilizing coccoliths are smaller than 125 µm in length. Most specimens are trochospiral showing resemblance to *Trochammina depressa*, but planispiral, unilocular, uniserial and biserial forms have also been observed. Specific identification is difficult due to compression, the small size of the tests, and the unusual building material. In the smallest trochamminids, the walls are composed of a single layer of coccoliths. The foraminifera were highly efficient in selecting and ordering the coccoliths, which always are placed with their distal surfaces facing outward. Apparently in order to fit the coccoliths closer together and to diminish the amount of empty spaces between them, the outline of the coccoliths - probably by a dissolution process - was modified from oval to hexagonal. The dissolution was extremely precise affecting only the rims of the coccoliths leaving all other crystal surfaces untouched.

In larger tests, the grain layer becomes layered as increasing amounts of cement covers the coccolith layer. The cement, which according to Energy Dispersive Spectroscopy (EDS) analyses consists of silica, was probably originally organic. The silica contains relatively few grains. They are of mixed sedimentary and skeletal origin. In contrast to the inner coccolith layer, the grains of the outer layer were apparently picked at random among the many sorts of grains available on the sea bottom. In 10-20% of the tests, the coccoliths are affected by a later dissolution phase, which attacked all the crystals of the coccoliths and not only their rims as during the early phase. The late dissolution may result in almost total disintegration of the coccoliths. The timing of the late dissolution is uncertain. Some evidences indicate that it occurred while the foraminifera were still alive, whereas others suggest that it occurred post mortem. Some of the biserial tests show a distinct ontogenetic shift from an early part constructed mainly of coccoliths to a later part constructed of sedimentary grains and cement.