

SOME COMMENTS CONCERNING SAMPLE PROCESSING AND DISSOLUTION

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Introduction

The dissolution of coccolith carbonate during certain methods of sample-processing of sediments is a long-known problem and occurs, to some extent, even in solutions of demineralised water buffered with ammonia. We performed some laboratory tests to find an alternative suspension medium for which three conditions had to be met: 1) the dissolution of coccolith carbonate should be prevented; 2) the solution should be easily and cheaply available; and 3) the sample processing should not be hindered.

Methods and materials

We tested six different liquids (see below) on four selected samples from different environments, of different ages, and with a large variety of species. The samples were: 1) a surface-sediment sample from the Arabian Sea, of Recent age (16.1% carbonate); 2) a piston-core sample from the continental margin off Chile, of Pleistocene age (4.3% carb.); 3) a sample from NE Germany, of Late Oligocene age (9.5% carb.) and 4) a sample from N Germany of Early Eocene age (6.0% carb.).

Methodology

One gram of sediment was placed in dilute suspension. The suspension was treated ultrasonically for one minute and was filtered through fleece-supported regenerated cellulose filters (Sartorius, 0.45 µm pore-width). In this way, a monolayer of all sediment particles was created, which was then investigated in the scanning electron microscope (SEM). This methodology was chosen in order to detect dissolution effects. This works much better with the SEM than with a light-microscope. It is not meant to be a standard methodology.

Observations on the alternative liquids

1. *Demineralised water (pH6.9)* - In all samples, all coccoliths were etched. Only large species were present, whilst small and weakly-calcified species had been completely dissolved. Interpretation: The liquid is corrosive to coccolith carbonate.

2. *Demineralised water with ammonia (pH10.9)* - Common etching of coccoliths in most samples. Good preservation only in Sample 1. Interpretation: Good preservation of carbonate-rich samples, etching and loss of small and weakly-calcified species in samples with low carbonate content.

3. *Tap-water from Hannover (pH7.7)* - Generally good preservation of coccoliths, sometimes slight overgrowth, rarely etched. Interpretation: The naturally high carbonate-content of the local tap-water makes it suitable for sample processing.

4. *Demineralised water saturated with CaCO₃ (pH9.6)* - In Samples 2, 3, and 4, etched coccoliths were predominant; in Sample 1, the coccoliths remained unaffected. In a few samples, overgrowth was found occasionally. Interpretation: Ambiguous - the carbonate content of the sample might be responsible for the difference in the carbonate preservation.

5. *Demineralised water saturated with technical (chemically-precipitated) CaCO₃ and buffered with ammonia (pH10.6)* - Good preservation of the coccoliths, sometimes insignificant overgrowth. Interpretation: The liquid is not corrosive to coccolith carbonate.

6. *Ethanol* - No etching of the coccoliths was found, however, the alcohol makes it very difficult to produce an evenly-distributed monolayer of sediment particles. Interpretation: The liquid is not corrosive to coccolith carbonate but the processing is difficult.

Conclusions and remarks

Based on the results of our small investigation, we now use demineralised water saturated with CaCO₃ and buffered with ammonia (pH10.6) as the standard liquid for sample-processing. We believe that the primary preservational state, the carbonate content, and possibly also other geochemical factors are important for the behaviour of each sample during sample processing and, consequently, for the preservation/dissolution of coccolith carbonate. However, we are aware that many questions could not be answered by our small experiment.