Compaction of microfossil and clay-rich chalk sediments

The aim of this study was to evaluate the role of microfossils and clay in the compaction of chalk facies sediments. To meet this aim, chalk sediments with varying micro texture were studied. The sediments have been tested uniaxially confined in a stainless-steel compaction cell. The sediments are: 1) Pure carbonate chalk with mudstone texture from Stevns Klint (Denmark), 2) Relatively pure chalk sediments with varying content of microfossils from the Ontong Java Plateau (Western Pacific), 3) Clay-rich chalk and mixed sediments from the Caribbean. The tested samples were characterised by porosity, carbonate content, and microfossil content. The texture was quantified by analysis of backscattered electron micrographs of polished sections. The samples do not compact along a common stress - porosity trend. This observation can be explained as a result of the differences in contest of microfossils and fine-grained silica and clay. Samples with relatively pure chalk mud supported texture compact along a common stress - matrix porosity trend. Microfossils thus have a passive role, apparently because they are supported by the chalk mud. Samples with fine-grained silica and clay can be modelled to follow the same trend if we assume that a part of the fine-grained silica and clay are in the supporting frame and that the remaining silica and clay has a passive pore-filling role. The modelled part of the day and silica in the frame varies from 0% to 100%. Porosity and sonic velocity variations for a given degree of consolidation may be a key to indirect interpretation of content of microfossils and pore-filling fine-grained silica and clay in chalk. (C) 2001 Elsevier Science Ltd. All rights reserved.

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