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Cyanobacterial key to the genesis of micritic and peloidal limestones in ancient seas

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The origin of micritic and peloidal limestones comprising the bulk of many ancient marine carbonate deposits represents a major unsolved problem of carbonate sedimentology. Our studies of such limestones from a sequence of Late Jurassic open marine sediments exposed in central Poland revealed them as products of in situ calcified mats of benthic coccoid cyanobacteria. Remains of the cyanobacteria are visible in scanning electron microscope (SEM) images as characteristic patterns closely resembling the common mucilage sheaths of modern entophysalidacean
and/or pleurocapsalean cyanobacteria comparable to those we found producing micritic and peloidal microbialites in Lake Van, Turkey. We suggest, by analogy, that many subtidal micritic and peloidal limestones common in the
marine sedimentary record might be products of similar in situ calcified cyanobacterial microbiota. Such an intensive calcification of marine cyanobacteria could have proceeded only in environments more than modern seawater supersaturated with respect to calcium carbonate minerals. Advection of excess alkalinity, originating from deeper, anaerobic or dysaerobic zones to shallow water areas is proposed as the main factor enhancing colonization of extensive sea bottom areas by the alkaliphilic cyanobacteria and promoting their in vivo calcification.

Key words: Cyanobacteria, biocalcification, palaeogeomicrobiology, carbonate sedimentology, micrite, peloids.