

## Microbially induced coated grains from the Late Cretaceous methane-seep deposits in Nakagawa, Japan

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Coated grains are found in the Late Cretaceous methane-seep deposits in the Nakagawa area, Hokkaido, Japan. We examined the coated grains using macro- and microscopic observations, electron-probe micro-analysis and biomarker analysis. The coated grains are round to oval-shaped, with nuclei consisting of fractured sediment and micritic envelopes. The fractures probably occurred as a result of increasing hydrostatic pressure when the sediment was still unconsolidated or weakly consolidated. Biomarker analysis revealed that two types of molecules, i.e., crocetane and PMI, are predominant in the hydrocarbon fraction with highly negative carbon isotopic composition as low as -122 per mil (vs. VPDB). These data suggest that the coated grains were formed under the influence of anaerobic oxidation of methane, near the sediment/seawater interface. The presence of such grains indicates that methane-containing pore water reached to the sea floor at that time.