Microbial processes during early diagenesis of carbonate reservoirs: A laboratory approach

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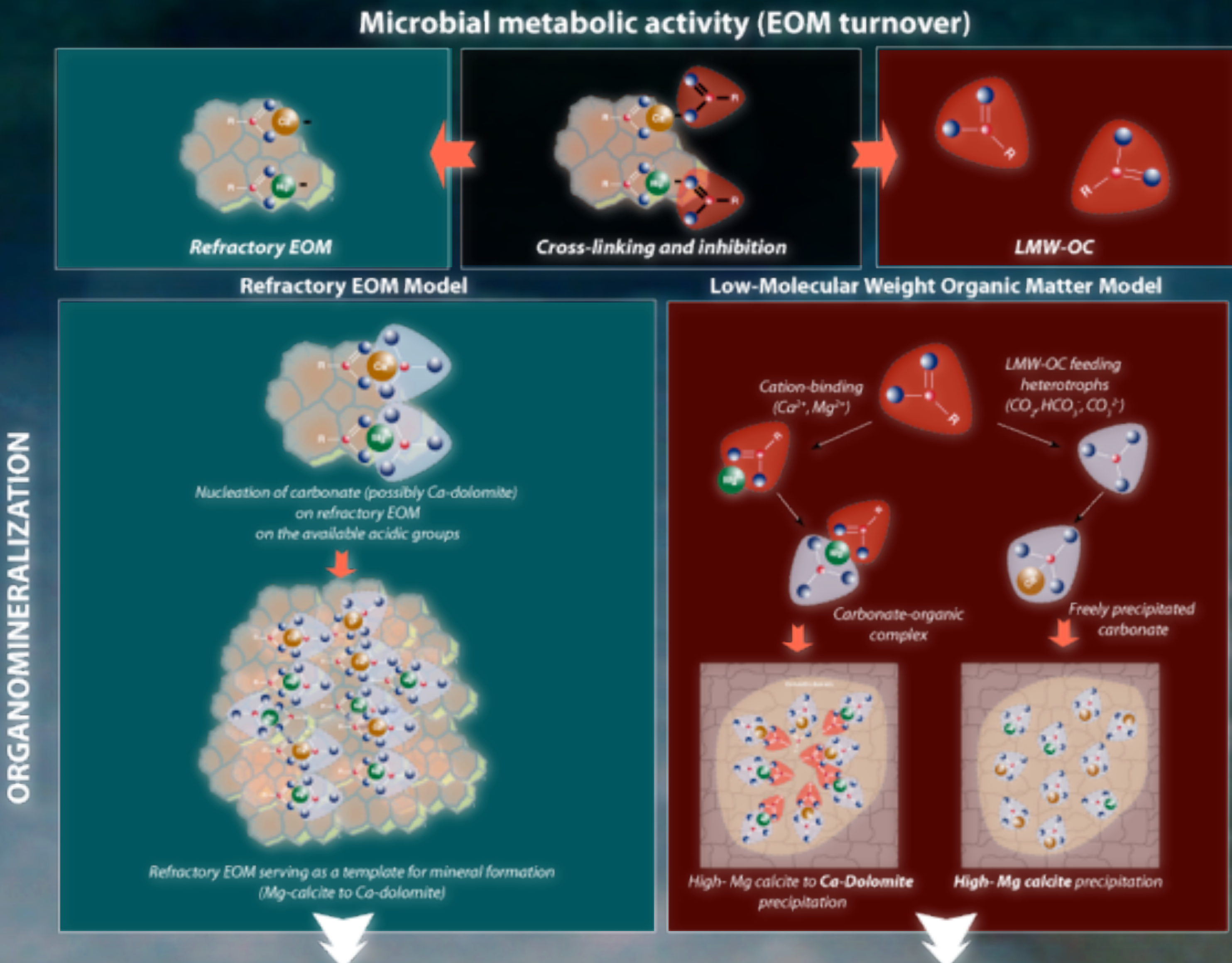

'Micropeloidal structures'

Extracelllular Organic Matter (EOM) have a strong affinity to bind cations. We found out that two different calcium pools bound to the EOM: one loosely bound that could be exchanged by dialysis or by moderate changes in pH and one that was more tightly bound and is not exchanged. Calcium binds to the various functional groups of newly produced EOM. This 'refractory-EOM'-Ca could form the other half of its bidentate complex with LMW organic compounds. The resulting 'refractory-EOM'-Ca-LMW organic carbon complex is avoiding Ca^{2+} to be available for precipitation (inhibition phase). However, this complex is highly labile and the LMW organic moiety could be readily removed by enzyme activity.

We are proposing a new conceptual model of microbially mediated $CaCO_3$ precipitation in the EOM matrix. Microbial oxidation of the LMW organic carbon yields inorganic carbon (CO_2/HCO_3^-), increasing the saturation index and enabling $CaCO_3$ to precipitate. This results in the formation of nucleation sites or 'pockets,' where early precipitation could occur. The $CaCO_3$ precipitate appears either associated with the 'refractory-EOM' or free in pockets within that matrix. The final result is a typical micropeloidal texture found in many fossil microbialites.