# Abiotic synthesis of disordered dolomite in agar gel medium

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The origin of dolomite is a long-standing enigma in sedimentary geology. It has been proposd that microorganisms can overcome kinetic barriers to facilitate dolomite precipitation [1, 2], although their specific role in dolomite formation and nucleation is still unclear. Microbial cell surfaces and excreted extracellular polymeric substances (EPS), which carry a negative electric charge, are capable to bind and accumulate $Ca^{2+}$ and $Mg^{2+}$ ions, and thus are frequently cited as the sites of carbonate nucleation [3]. Herein we provide a new mechanism to explain the dolomite crystallization associated with microorganisms. Our experiments demonstrate that disordered dolomite can be synthesized abiotically in systems of agar gel medium and aqueous solution mixtures at room temperature. The dehydration / desolvation of hydrated surafce $Mg^{2+}$ has been recognized as a critical kinetic barrier to dolomite nucleation [4]. Dissolving a low dielectric constant solvent in water will lower the dielectric constant of the solution, and thus can reduce the solvation energies of dissolved cations [5, 6]. Therefore, we propose that the agar, which has a low dielectric constant, lowered the solvation energy of strongly hydrated $Mg^{2+}$ ions in solution, and thereby enhanced their dehydration and incorporation into dolomite nuclei. It is possible that EPS may play a similar role as agar does in promoting dolomite nucleation and crystallization in natural environments. Our new findings may shed new light on the understanding of the role of microorganisms in dolomite formation.

[1] Vasconcelos & McKenzie (1997) *J. Sediment. Res.* **67**, 378–390. [2] Vasconcelos *et al.* (1995) *Nature* **377**, 220–222. [3] Dupraz *et al.* (2004) *Sedimentalogy* **51**, 745–765. [4] Lippmann (1973) *Sedimentary Carbonate Minerals*. Springer, New York. [5] Harvey & Prausnitz (1987) *J. Solution Chem.* **16**, 857–869. [6] Wang & Anderko (2001) *Fluid Phase Equilibr.* **186**, 103–122.

# Sedimentary environments and factors of marine organic-rich source rocks in Ordos Basin, China

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On the base of detailed research on sedimentary structure, biological developments, depositional environment, geochemical characteristics and generated hydrocarbon simulation experiment by petrography and organic geochemistry, it is confirmed that marine organic-rich source rocks is developed in Pingliang formation, southwestern Ordos basin. Its organic macerals contain sapropelic group, animal organism and exinoid group. The organic matters are dominated by Type I, and a few samples belong to Type $II_1$ (Fig. 1).

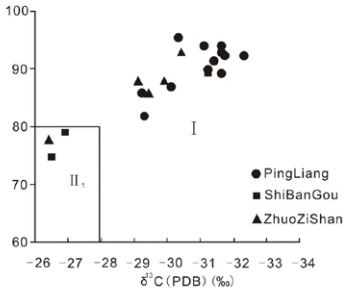


**Figure 1:** Correlation diagram of $\delta^{13}C$ and Ity

There is a high carbon abundance in the source rocks with a total organic matters (TOC) of 0.2% to 2.0%(Figure 2). According to analysis on the vitrinite reflectance and saturated hydrocarbon gas chromatographic, it is situated in post-mature dry gas phases and has high hydrocarbon generation potential by modeling hydrocarbon generation history. So it is thought as the main source rocks in Ordovician marine strata, Ordos basin. Finally, it is developed in the paleogeographic environment of strong reduction, oxygen deficiency, deep water slope by analyzing trace element geochemical characteristics and petrologic characteristics.

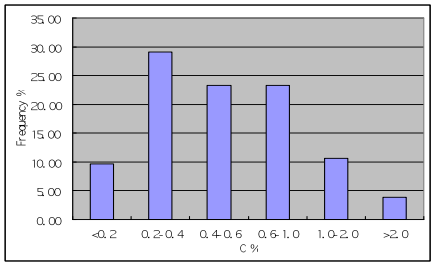


**Figure 2:** "C" frequency diagram in Pingliang formation.