## Evidence for micrite formation <br> by particle-dominated mineralization

S. Frisia ${ }^{1}$, S. Rubanov ${ }^{2}$, A. Borsato ${ }^{1}$, G. Gattolin $^{3}$, G. Della Porta ${ }^{4}$, C. Marjo ${ }^{5}$, A. RICH ${ }^{5}$, P. Dove ${ }^{6}$
${ }^{1}$ Dept. Earth Sciences, University of Newcastle,
Australia; silvia.frisia@newcastle.edu.au
${ }^{2}$ MAMF Bio21, University of Melbourne, Australia; sergey@unimelb.edu.au
${ }^{3}$ University of Padova, Italy;
Giovanni.Gattolin@gmail.com
${ }^{4}$ University of Milan, Italy; giovanna.dellaporta@unimi.it
${ }^{5}$ University of New South Wales, Australia; c.marjo@unsw.edu.au; a.rich@unsw.edu.au.
${ }^{6}$ Virginia Tech. Dept. Geosciences, VA, USA;
dove@vt.edu
The origin of micrites in the geologic record is a long-standing subject of debate. Here we conducted a high resolution study of samples that included ancient marine microbialites and modern continental deposits using high-resolution Transmission Electron Microscopy.

By examining micrites at lattice fringe resolution, we find these materials are disorganized aggregates of nm-scale particles (Fig. 1) that suggest mineralization by non-oriented or only partiallyoriented particle nucleation and attachment processes (De Yoreo et al., 2015, Science). The findings from all environments of formation represented in this study, which include a shallow marine platform, a thermal pool and an alkaline lake, suggest micritic materials arise from particle-dominated processes The Mg content of these materials spans from 3-4 $\mathrm{mol} \% \mathrm{Mg}$ to $50 \%$.


Fig. 1 - Nanocrystal aggregate in recent micrite.

The structural evidence suggests these nanocrystal aggregates can further transform into microsparite and sparite with modulated microstructures, or remain preserved for hundred of millions of years. Our data suggest preservation my be favoured by the presence of clay. Evidence for particle attachment processes in diverse environments suggest micrite formation can be driven by local inorganic conditions and microbes are not required.

