A curious case of dolomite – insight on the origin of dolomitization in ancient plaster

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In our previous study we reported unprecedented case of reformation of dolomite within a plaster found on the site of Neolithic settlement in Motza, Jerusalem Mountains, Israel [1]. This is an extremely rare case of dolomite reformed from silt, phenomenon rooted in “dolomite problem” – inability to form dolomite under non-geological conditions. In the current work we compare several geological dolomites in terms of stoichiometry and ion disorder to identify the factors within the precursor, geological dolomite found in the vicinity of the archeological site and used for plaster preparation, that could lead to the phenomenon.
Stoichiometry and cation disorder of the dolomites of various ages (Cambrian, Silurian and Cretacious) were studied by means of XRF (X-ray fluorescence), PXRD (powder X-ray diffraction) and EXAFS (Extended X-ray absorption fine structure). It was found that younger (Cretacious) dolomite from Motza which served as plaster precursor has higher Ca-content and is more disordered, meaning Ca and Mg ions are mixed to some extent rather than being localized at distinct layers, resulting in lower COD (cation order degree) and higher Debye-Waller factor as indicated from EXAFS.

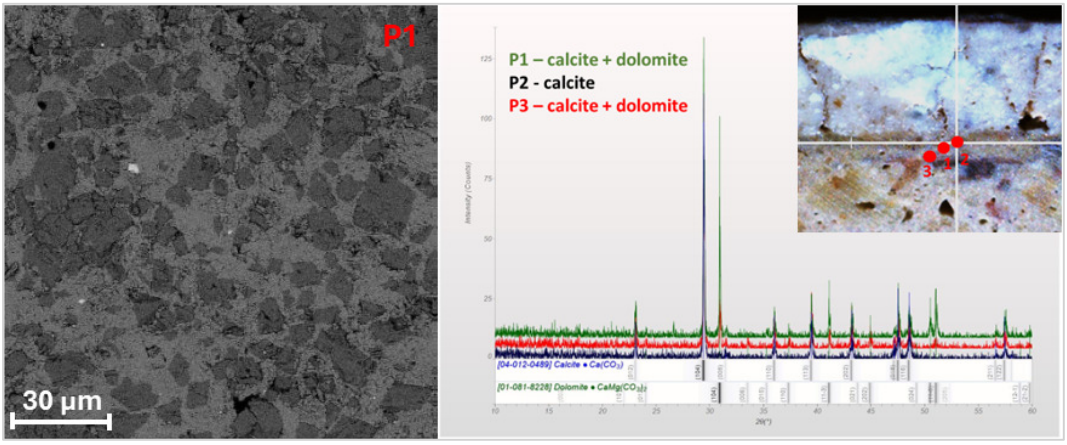


Figure 1. *Microarea diffraction from Neolithic plaster confirms presence of reformed dolomite*

Upon firing and consequent recrystallization, newly produced dolomite formed variety of non-stoichiometric phases while each one was better ordered comparing to the parental mineral. We discuss why mineral nature and firing conditions could lead to dolomitization within the plaster and importance of it.

[1] Y. Maor, D. Yegorov, A. Kossoy, Y. Feldman, H. Khalaily, J. Vardi, Y. Asher, submitted to J. of Archeological Science.