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Potential degradation mechanisms of stylolitic limestones

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Stylolites are irregular rough surfaces formed due to the pressure-solution process and commonly developed in carbonate stones. Stylolite formation is usually accompanied by the accumulation of insoluble residues i.e. organic matter, oxides and clays on the stylolitic surfaces. The amount and the type of these clays may play a significant role in the deterioration of the host stone. This study presents the characterization of various stylolitic limestones containing different amounts of clays and used extensively as building cladding and decorative stones in Israel and in Hungary.

The first case study focuses on two lithotypes from Israel, both of them are biocalcirudite-calcarenite with high amount of bioclasts. Abundance of open stylolites filled partially with organic matter and minor amounts of clays exist in the first lithotype with cream colour. The second lithotype has grey colour and contains organic matter and pyrite dispersed throughout the stone and more concentrated within the stylolites along with clay and dolomite crystal. Both lithotypes exhibit signs of decay just after a few years of exposure.

The first studied Hungarian limestone is a red Jurassic carbonate (ammonitico rosso type) that was formed in pelagic marine environment. This wackestone contains abundant pelagic microfossils. The limestone has been used from Roman period in Central Europe in Hungary, Romania and Poland. The stylolites are seen as darker bedding parallel seams containing minor amounts of clay and hematite. Small amount of clay is also found in isolated nodules. The second Hungarian lithotype is also a Jurassic limestone which contains less clay than the previous one. This yellowish-white limestone is strongly cemented and contains red intersecting stylolites that do not follow the bedding planes or stratification.

The main aim of this study is to understand and evaluate the damage mechanism of different stylolitic limestones. Samples were exposed to multiple thermal and wet/dry cycles to assess the durability. Changes in the strength and weight of the stone material are measured under laboratory conditions.