

Development of protocol for determination of natural stone bioreceptivity

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Biodeterioration of stone surfaces in modern structures and cultural heritage is a problem that does not only affect the aesthetic appearance of stone elements but also changes their functionality due to material degradation and has indirectly a significant influence on the economy. The term bioreceptivity describes a material's susceptibility for the population of living organisms (Guillitte, 1995). Methods for bioreceptivity determination are usually based on a quantification of a grown microbiological mass on an exposed stone surface which was artificially inoculated with a pioneer organism (Guillitte and Dreesen, 1995; Miller et al, 2012). In our study a protocol for bioreceptivity determination was implemented based on an image analysis of autofluorescing pioneer organisms on sample surfaces exposed in growth chamber under specific laboratory conditions. The method is primarily meant for assessing the direct influence of intrinsic features of a rock on the rock's sensitivity for organism growth. Bioreceptivity has been determined on fifteen frequently used commercial types of natural stone for construction purposes in Slovenia. Mineral composition was determined with the help of microscopy and x-ray diffraction. Inoculated were three autotrophic organisms: *Chlorella vulgaris*, *Chroococcus minutus* and *Pseudococcomyxa* sp. Due to the fastest growth and insensitivity, the most appropriate microorganism for the laboratory experiment of bioreceptivity proved to be *Chlorella vulgaris*. It was established that different natural stones have a different bioreceptivity which depends on their mineral composition, roughness and physical features, e.g. type of porosity. In case of dry surface samples, the soaking of the surface and the capillary-type pores have the greatest influence. On the other hand, results of bioreceptivity analysis examinations of water saturated samples show the prevalence of other mechanisms where the influence of mineral composition of a rock and grain size is likely to be higher.

Literature

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