

## Natural weathering of biomaterials' surface: mechanisms and implications

Jakub Sandak<sup>1,\*</sup>, Anna Sandak<sup>2</sup>

<sup>1</sup> Trees and Timber Institute CNR-IVALSA, San Michele All'Adige, ITALY

\* Corresponding author: sandak@ivalsa.cnr.it

**Abstract:** Recent developments in materials science lead to discoveries on novel bio-based building materials, offering wide range of outlooks, starting from traditional rustic to modern design products. Their functional performance is usually improved by a proper selection of the raw resources, treatments, impregnations or other modifications. Unfortunately, biomaterials will deteriorate during service life due to several processes, such as weathering, oxidation, biodegradation, wear or decay. As a consequence, biomaterials may loss visual appeal leading to a perceived need for replacement even if the material is far from reaching functional failure. The research reported here was dedicated to understand mechanism of the material deterioration exposed to natural weathering in different locations in Europe. Several surface properties, including color, gloss, roughness, as well as chemical composition and erosion rate were monitored with dedicated sensors. The resulting data were used for modeling of the weathering mechanisms. An original approach for determination of the aesthetical appearance of the deteriorated surface was also developed. The model bases on the dose-response approach, being able to simulate different climate conditions, locations and architectural solutions. Even if the weathering itself does not affect functional performance of products, it highly influences the customer perception and therefore should be considered when designing products or structures.

**Keywords:** Biomaterials for buildings, Aesthetics, Service life, Weathering, Surface characterization