

INVESTIGATION ON THE WEAR RESISTANCE OF GEOCORAIL: A NEW NATURAL CONCRETE

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ABSTRACT

The purpose of this study is to characterize the wear response of a new material named Geocorail. Electrochemical process drives the growth of this natural material directly in the sea. In fact, the natural calcareous deposit [1,2] is developing between natural grains of sand, sediments and debris of sea shell. After few months, a solid aggregate may be used as a mechanical reinforcement in order to consolidate the coastline and protect the maritime constructions.

The main goal of the Geocorail start-up is to understand how the growth of the aggregate can be optimized in terms of mechanical behaviors, as well as the mechanical resistance in static loading and wear response. Then an experimental design with different electrochemical parameters and sand granulometry was conducted in the Geocorail laboratory based in Fos/Mer to obtain different samples from 3 months to 1 year living and growing in seawater (Fig1). Mechanical tests were defined in order to qualify and maybe quantify the mechanical properties, and the characterizations were done in MSMP laboratory in Aix-en-Provence.



Fig.1: Geocorail's sample after 5 months (Top view on the left, cross section on the right)

As the other mechanical tests, the tribological behavior of the aggregate is difficult to investigate in standard conditions used for "industrial concrete" [3], mainly due to the small size and heterogeneity of the samples. The samples were too small

to quantify the abrasive response using standard for natural stones [4]. Then, our first goal was to determine a significant experimental approach to quantify the wear response. After few months in the seawater, the average thickness of the samples is about 10 to 30 mm. Furthermore, the shape of the aggregate all around the steel stem is not very regular (Fig. 2).



Fig.2: 10 months' Specimen for wear test

In order to perform the wear test, resin is used to form samples with quite equivalent area of friction surface and with the same position of the steel stem. Response of different samples are obtained in water lubricated wear test under constant pressure with SiC counterpart. To complete the analysis, other materials such as normalized mortar (sand granulometry and dosage of the cement) and a natural stone "Pierre du Pont du Gard" (sedimentary natural stone) are characterized using the same protocol.

The first results obtained show that Geocorail specimens:

- are much more resistant than this natural stone,
- present the wear resistance level quite equal to the normalized mortar.

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