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NDT applied to monitor accelerated corrosion phenomena in engineering structures: a laboratory test with RC specimens

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Corrosion of reinforced concrete structures represents one of the main causes of degradation for civil structures and infrastructure, making the development of innovative strategies for monitoring their health strongly recommended. In this context, non-invasive geophysical methodologies have been demonstrated to be effective, but the information provided is often qualitative and not fully usable for engineering purposes [1-2].

A laboratory test was conducted at the Hydrogeosite CNR-IMAA facility to explore the potential of resistivity methods and electromagnetic techniques, aiming to uncover new relationships between signal variations and degradation phenomena.

Using an integrated approach, including Ground Penetration Radar (GPR), ultrasonic tests, and electrical techniques within the framework of the Icarus Project (PRIN Project 2022), a set of reinforced concrete samples was designed and subjected to accelerated corrosion tests in a saline solution. These samples are continuously monitored to identify corrosion phenomena in the rebar and degradation of the concrete.

The final goal of the test is to experimentally link bond-slip performance through the combined use of non-destructive testing (NDT) methodologies, supported by mechanical pull-out tests. This study highlights the pressing need to develop innovative strategies for monitoring the health of reinforced concrete structures, given the significant risks posed by corrosion. The integration of geophysical and non-destructive testing (NDT) methodologies forms the core of this research, aiming to bridge the gap between qualitative data and actionable engineering insights.

The methodologies developed in this study offer practical applications for assessing corrosion levels in reinforced concrete structures. The integration of geophysical and conventional NDT data provides an efficient, non-invasive approach for routine monitoring, which is particularly valuable for monitoring engineering structures.

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