

IPaintS - Intelligent Coatings for Concrete Structures: immobilization of pH indicators on coating membranes

Ana F. Cristino^{1*}, Julia Lopreto², Helena Silva¹, António Santos Silva¹, Maria Paula Rodrigues¹, Susana Cabral-Fonseca¹, Olga Ferreira², Joaquim Teles Nunes³, Bruno Soeira³ and Rui Galhano dos Santos²

¹Materials Department, National Laboratory for Civil Engineering, Avenida do Brasil, 101, 1700-066 Lisbon, Portugal

²CERENA-Centre for Natural Resources and the Environment, Instituto Superior Técnico, Av. Rovisco Pais, 5, 1049-001 Lisbon, Portugal

³Sika Portugal - Produtos de Construção e Indústria, S.A, Rua João Oliveira Ramos, 3880-009 Ovar, Portugal

Abstract. In Portugal and over the world, a significant number of concrete structures face challenges due to expansive chemical reactions, such as the alkali-silica reaction (ASR). These reactions have been shown to cause various types of damage, with microcracking being the most common, resulting from internal stresses created by the expansion of reaction products. It is well-documented that, over time, these microcracks can develop into significant fissures due to the hygroscopic nature of these products, which accelerates concrete degradation and potentially compromises structural integrity. One key aspect of ASR products is the presence of alkaline hydroxides in the gel formation process, resulting in elevated pH levels. When this gel reaches the concrete carbonated surface, a change in pH occurs. Based on this premises, the project IPaintS was undertaken to develop a coating that could detect the formation of ASR products on concrete surfaces by identifying variations in pH. This paper presents the results of the preliminary tests conducted, specifically the tests performed to confirm the possibility of immobilising pH indicators in a coating membrane and assess performance characteristics of the functionalised coating. Results show the effective immobilization of a pH indicator on a coating membrane without the loss of some fundamental properties of both the indicator and the coating membrane.

* Corresponding author: acristino@lnec.pt