Potential Reactivity to Alkalis of Portuguese Volcanic Aggregates for Concrete

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Abstract

In Portugal, volcanic rocks are commonly used as concrete aggregates for concrete in Madeira and Azores Islands and in a lesser extent in the Mainland. Nonetheless, the information about the potential alkali-silica reactivity of Portuguese volcanic rocks is rather scarce. In order to fulfill this lack of information and in the scope of a Portuguese research project, four volcanic aggregates from the Portuguese Mainland and Madeira Archipelago were investigated. For this purpose petrographic characterization (polarizing microscopy complemented by bulk chemical analysis and scanning electron microscopy with energy dispersive detector) along with expansion laboratory tests were carried out. In this paper, results of the investigation are presented aiming to establish a possible correlation among the results from the used methods.

Keywords

AAR • Volcanic aggregates • Petrographic examination • RILEM AAR-4.1

10.1 Introduction

Reports on alkali-reactivity of volcanic rocks have been made worldwide, particularly in Japan, Iceland, Turkey and New Zealand. The reactivity has been especially attributed to rocks' chemical/mineral composition and to the presence of silica minerals and SiO_2 rich glass. In Portugal, till now, little investigation has been developed concerning the alkali reactivity of volcanic rocks, although these aggregates are commonly used in Madeira and Azores Atlantic Islands, as well as in the Mainland although to a lesser extent. In this paper, a preliminary investigation in the scope of project IMPROVE (Improvement of performance of aggregates in the inhibition of alkali-aggregate reactions in concrete) is presented concerning the petrographic examination of distinct volcanic aggregates and their performance in laboratory expansion tests.

10.2 Materials and Methods

Four active quarries were selected for sampling of volcanic rocks, three of them being located in Madeira Archipelago while one is situated in the Portuguese Mainland. The rocks are Late Miocene to Holocene in age at Madeira (Brum da Silveira et al. 2010) and Late Cretaceous in the Mainland (Zbyszewski 1964). The aggregates samples are designated as BS6, BS7, BS8 and BS9.

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