Development of research related to alkali-silica reaction in concrete with recycled aggregates

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ABSTRACT: Since there is a possibility of incorporating recycled aggregates (RA) as a complement to primary aggregates (PA) in concrete production, taking advantage of construction and demolition waste, there are some questions on the durability of concrete with recycled aggregates (CRA) that need to be answered.
The durability of concrete with primary aggregates only (CPA) is conditioned, among other factors, by its degradation due to alkali-silica reactions (ASR). Since the first cases of ASR in CPA were identified, this expansive reaction has been a research theme resulting in the development of prevention and mitigation methodologies and in the comprehension of the chemical reactions involved.
The present paper proposes to describe the current development of a research program on ASR in CRA based on an experimental campaign involving the production of CRA with different replacement ratios of coarse PA with coarse concrete RA, the use of different cement classes, and variations on the concrete curing conditions and on the reactivity of the mixes.

1 INTRODUCTION

Alkali-silica reaction (ASR) is one of the chemical degradation causes of concrete with mineral aggregates (CMA). These reactions are included among the internal expansive reactions and occur in the simultaneous presence of high amounts of alkalis, reactive aggregates and humidity. During the reaction a silica-alkaline gel is developed that expands in the presence of humidity leading to various phenomena within the concrete that condition and change its properties. Research in this area has tried mostly to understand the expansive mechanism and the methodologies for its prevention and mitigation.

The incorporation of recycled aggregates (RA) in concrete, namely those from crushed concrete, as a complement to mineral aggregates (MA) leads to some questions related to its durability. In order to know the CRA in the same areas as the CMA it is necessary to study the possible causes of their degradation.

The theme of the research work presented in this paper was triggered by the possible occurrence of ASR in CRA and its manifestation perhaps being a consequence of the potential reactivity of the RA from the original crushed concrete.

An experimental campaign on ASR in CRA is presently being developed in order to understand how the total or partial incorporation of RA in concrete changes this deleterious reaction development, and to what extent the incorporation of RA in concrete is effective without risk of ASR.

Various CRA will be produced containing different replacement ratios of coarse MA with