

# Microstructural characterization of catalysis product of nanocement based materials: A review

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**Abstract.** Cement as an essential element for cement-based products contributed to negative environmental issues due to its high energy consumption and carbon dioxide emission during its production. These issues create the need to find alternative materials as partial cement replacement where studies on the potential of utilizing silica based materials as partial cement replacement come into picture. This review highlights the effectiveness of microstructural characterization techniques that have been used in the studies that focus on characterization of calcium hydroxide (CH) and calcium silicate hydrate (C-S-H) formation during hydration process of cement-based product incorporating nano reactive silica based materials as partial cement replacement. Understanding the effect of these materials as cement replacement in cement based product focusing on the microstructural development will lead to a higher confidence in the use of industrial waste as a new non- conventional material in construction industry that can catalyse rapid and innovative advances in green technology.

## 1 Introduction

In facing the new era, issues of sustainability and durability of construction industry are often emphasized on the pursuit of finding materials as partial cement replacement to decrease the high energy consumption and carbon dioxide emission during cement production [1]. The candidates that can be used as cement replacement must have two characteristics: high reactive silica content and very fine particle size. Any material that has these characteristics can produce pozzolanic reaction that can improve cement based

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