



## Effect of cement consumption on durability properties of concrete against alkali reactions

Mahmoud Layegh Rafat<sup>1</sup>, Mahmoud Anvar Rigi<sup>2</sup>, Morteza Layegh Rafat<sup>3</sup>, Mohsen Rigi<sup>4</sup>

1- Department of Civil Engineering, Zabol Branch, Islamic Azad University, Zabol, Iran

2- M.Sc Department of Civil Engineering, Zahedan Branch, Sistan and Baluchestan University, Iran 3- M.Sc Civil Engineering, Sistan and Baluchestan University, Iran

4- M.Sc student Department of Civil Engineering, Zahedan Branch, Sistan and Baluchestan University, Iran

## Abstract

According to the abundant use of engineer and factor designer about the function of concrete in different environmental conditions, it's important to analyze the methods and new technologies of factors and concrete and adopted with environmental condition and function of Iran. One of the main causes of destroyed concrete is the alkali-carbon reaction of the aggregates. In this paper, the aggregates are chosen from three resources in Iran. Mortar bar method, accelerated mortar bar test, accelerated concrete prism test were performed on experimental samples and some solutions were expressed for the concrete to be remained properly. According to the results, it is concluded that among these three methods, accelerated mortar bar test (with choosing appropriate Expansions criterion, is the best method to the evaluate Alkali-carbonate reactions.

Keywords: Concrete, Durability, alkali reactions

## 1. Introducción

Concrete is used widely all around the world because of its obvious advantages. The quality of concrete depends on the quality of the three important criteria which are cement, stone and water and profession during its making, pouring and operating.

The history of finding stones Alkali reaction gets back to the 1930s, Which in that time some non explainable expansion were observed in some of main concrete structures in California State such as some schools, bridges and coastal walls.

In that time no reasons were found for these cracking and expansions until late in 1930s. An American engineer named Stanton, keeping mortars cylinders in special conditions observed that in the surface of them, cracking similar to real mentioned cracks in concrete structures has occurred. After more searches and changing the conditions, the reason for the cracking and expansions were discovered, that is the alkali reaction of the stones.

Chassevent in 1937 were in charge of measuring the amount of reactions of ashes with the use of Potassium solution. Purdon in 1940 did the first wide laboratory experiment on clinker cement which includes ash and sodium chloride and the alkali which were made by Alkaline salt.

In late 1957, Glukhovsky found out the possibility of producing cement which is made from the mixture of calcium and or Aluminum silicate with no clay and Alkaline iron solution. He named it dust cement and called the concrete dependent to it as dust silicate. Based on its primary mixture this could have been divided into 2 groups: Alkali mixture system  $Me_2O-Me_2O_3-SiO_2-H_2O$  and ground Alkali mixture system  $Me_2O-Me_2O_3-SiO_2-H_2O$ .

In the resent years a wide range of experiments are performed on cement having Alkali reactions and the concrete resulted from it. Trief and F-type cement of Scandinavia (Fross 1983) and Alkali cement mixtures are from the latest examples.

In 1981, Davidovits in French produced a mixture, combination of alkali, lime and dolomite. He named this mixture Geopolymer because it had a polymer structure. Malek and the colleagues in 1968 and Krivenko in 1994 completed and expanded this studies.

About the mechanism of the expansion in this process, different ideas are available. One suggestion is that expansion by the absorbing humidity with the clay which is not already humid. The other suggestion is that clay increase the ability