

Received: 23 April 2020 • Accepted: 19 July 2020

Research

doi: 10.22034/jcema.2020.233594.1028

Iranian Eocene Green Tuffs as Natural Pozzolan for Use in Cement Industries

Jafar Sobhani ^{*1}, Ali Reza Pourkhorshidi ², Fariborz Masoudi ³

¹ Department of Concrete Technology, Road, Housing & Urban Development Research Center (BHRC), 13145-1696, Iran.

² Road, Housing and Urban Development Research Center, Tehran, Iran.

³ Shahid Beheshti university, Tehran, Iran.

*Correspondence should be addressed to Jafar Sobhani, Department of Concrete Technology, Road, Housing & Urban Development Research Center (BHRC), 13145-1696, Iran. Tel: +982188255942; Fax: +982188255941 ; Email: ja_sobhani@yahoo.com.

ABSTRACT

Eocene Green Tuffs are widespread in Central Alborz in the north of Iran. In parts, they are used as natural Pozzolan. In this study, the Pozzolan activities of tuff samples from Qazvin to Semnan in Alborz Mountain were examined. The Pozzolan activity patterns vary in different beds and even change laterally. Chemical examination of the samples indicated that they all belonged to the acidic rock group and were consistent with related standards. The Pozzolan activity was calculated for samples using a hydraulic factor, thermal analysis, and ion concentrations. Data obtained based on the thermal analysis presented a range of Pozzolan activities for tuffs with similar chemistry and appearance. It was found in this research that mineralogy and texture controlled Pozzolan activity. Tuffs with high activity had glass in their matrix, but weathering and recrystallization reduced the activity. Petrographical examinations play an essential role in evaluating the availability of tuffs as natural Pozzolan in Central Alborz.

Keywords: Natural Pozzolan; Petrography; Pozzolan activity; Alborz Mountains; Plateau of Iran

Copyright © 2020 Sobhani, Jafar. This is an open access paper distributed under the [Creative Commons Attribution License](https://creativecommons.org/licenses/by/4.0/). *Journal of Civil Engineering and Materials Application* is published by [Pendar Pub](https://www.pendardar.com/); Journal p-ISSN 2676-232X; Journal e-ISSN 2588-2880.

1. INTRODUCTION

Natural Pozzolans are silicate rocks and deposits widely assessed in construction and building materials [1,2]. Ancient Greeks and Romans were the first people who used them in combination with lime to make natural cement. Nowadays, Pozzolan cement is a mixture of Portland cement and Pozzolan. Natural Pozzolans have become important because of their role in concrete durability [3,4] and reducing CO₂ emission. Iran is geologically situated in an organic belt, and volcanic rocks capable as natural Pozzolan are common in many parts of the country. One of the known sources for Pozzolans in northern Iran is Eocene Green Tuffs [5]. The

Eocene marine volcano-sedimentary sequence in the southern flank of Alborz Mountains in Iran is ~3-4 km thick. It extends along the length of the Central Alborz (Figure 1) with the greatest outcrop in the west and tapers, while becoming less continuous towards the east [6-8]. The Alborz Mountain Range consists mainly of late Precambrian to Eocene sedimentary and Paleogene andesitic volcanic and intrusive rocks. Eocene Green Tuffs are a part of the Karaj Formation. The formation mainly consists of calc-alkaline, volcanic, and volcanoclastic rocks and shales [6, 9-12] which are deposited in an arc and back-arc setting, probably formed