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# The use of the Algerian southwest volcanic rocks as supplementary cementitious materials (SCMs)

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***Abstract*— This study is part of a sustainable development policy that is dictated by the growing needs of material resources and the requirements of environmental protection. It addresses an investigation on the possibility of using volcanic powders as supplementary cementitious materials for environmental-friendly durable concrete. The work attempts to characterize several volcanic rocks (basalt, olivine andesite, amphibole-biotite andesite, amphibole andesite, hyodacite and scoria) from the mineral and chemical viewpoint and evaluate their pozzolanic activity. Furthermore, a supplementary cementitious material, used by many cement plants in Algeria, has been included in order to establish a comparative study.**

***Keywords*—**, mineral characteristics, chemical characteristics, pozzolanic activity.

## I. Experimentation

In the first stage, several volcanic rocks were characterized from the mineral and chemical viewpoint. In order to make the petrographic identification, a number of thin sections of volcanic rocks were examined under a Nikon Polarized Light Microscope (Eclipse LV100Pol). The XRD powder pattern was recorded on a Siemens D-5000 X-ray diffractometer, with Kα cobalt anticathode (λ = 1.789 Å), at a current of 40 mA and voltage of 40 kV. The scans were performed in the 2θ range from 0° to 70° with a scanning speed of 2°/min. The chemical compositions of raw materials were determined by X-ray Fluorescence (XRF) using a Philips PW 1404 X spectrophotometer.

In the second stage, the evaluation of pozzolanic activity of various volcanic rocks by means of mechanical strength tests was established. The preparation of the mortars was carried out according to the norm NFP 15-403 (NFP 15-403 2006). A control mixture was produced with a constant binder/sand/water proportion of (1/3/0.5). In the test mixtures, 20% of the mass of Portland cement used in the control mixture was substituted by the same mass of the test supplementary cementitious materials. The strength activity index with Portland cement as follows: SAI =


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($\sigma_{tm}$ /$\sigma_{cm}$) x 100, where$\sigma_{tm}$ is the average compressive strength of test mixture specimen and $\sigma_{cm}$ is the average compressive strength of control mixture specimen.

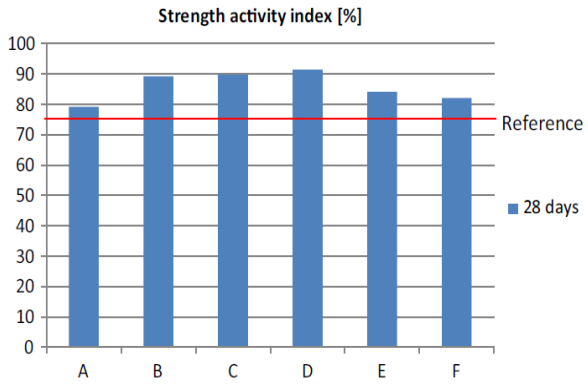


Fig.. Pozzolanic reactivity of the additions at 28 days.

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