



“Gheorghe Asachi” Technical University of Iasi, Romania



PRELIMINARY STUDY ON VALORIZATION OF SCRAPS FROM THE EXTRACTION OF VOLCANIC MINERALS

Federica Piccolo¹, Federica Gallo¹, Fernanda Andreola¹, Isabella Lancellotti¹,
Bruno Maggi³, Luisa Barbieri^{1,2*}

¹Department of Engineering “Enzo Ferrari”, University of Modena and Reggio Emilia,
Via P. Vivarelli 10/1, 41125, Modena, Italy

²Interdepartmental center for applied research and services in advanced mechanics and motoring,
INTERMECH-Mo.Re., Via P. Vivarelli 10/1, 41125, University of Modena and Reggio Emilia, Modena, Italy

³EuroPomice srl, Via Napo Torriani 1, 20124, Milano, Italy

Abstract

Powders < 3mm of pumice and lapillus (quarry scraps of national volcanic minerals) were employed in the tailoring and characterization (from the physical, chemical and mechanical point of view) of geo-polymers and lightweight aggregates. Geo-polymers were obtained at room temperature by substituting 70 - 80 wt% of metakaolin by volcanic scraps and employing an alkaline solution with a Na₂SiO₃/NaOH ratio from 0.8 to 1 for pumice and lapillus series, respectively. Within 24 h and in water, bulk specimens resulted with good integrity, with pH values around 9-11 and conductivity increasing over time, but less for the lapillus-containing sample richest in metakaolin indicating more compactness. The porosity, ranging around 32-33% for all the samples, increased up to 45% for the formulation based on 80% of lapillus. The best mechanical performance was achieved by lapillus samples: compressive strength in the range 35-38 MPa against 6-8 MPa of pumice ones. Lightweight aggregates were created by powder sintering at 1000 °C for 1 hour of 85 wt% of volcanic scraps and 15 wt% of spent coffee grounds used as pouring agent. Additional formulations were realized adding 50 wt% of nourishing mixture P and K-containing in the form of animal bone meal and vegetable biomass ashes. The specimens resulted porous and light (porosity around 60%), with good capacity of water retains, and, except in two cases, with neutral pH and conductivity values below 2 mS/cm, indicating a possible use for substrate (growing layer) in roof gardens, green roofs, house gardens, etc..

Key words: geo-polymers, lightweight aggregates, quarry scraps, recycling

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* Author to whom all correspondence should be addressed: e-mail: rungnapatongpool@gmail.com; Phone: +66 25646500; Fax: +66 25646404