



Torino 19-21 September 2022

# ABSTRACT BOOK

a cura della Società Geologica Italiana



GEOSCIENCES FOR  
A SUSTAINABLE FUTURE



*PRESIDENTS OF THE CONGRESS*

Rodolfo Carosi and Daniele Castelli.

*SCIENTIFIC COMMITTEE*

Germana Barone, Fabrizio Berra, Matteo Berti, Fernando Camara, Piergilio Cappelletti, Claudio Chiarabba, Rita Chirico, Renato Colucci, Chiara D'Ambrogi, Rosanna De Rosa, Laura De Santis, Daniela Ducci, Patrizia Fumagalli, Biagio Giaccio, Fausto Guzzetti, Giulia Innamorati, Ilaria Mazzini, Mimmo Palano, Claudia Piromallo, Mario Soldati, Stefania Venturi, Andrea Zanchi.

*ORGANISING COMMITTEE*

Donato Belmonte, Sabrina Bonetto, Bernardo Carmina, Francesco Dela Pierre, Evdokia Tema, Lorenza Fascio, Salvatore Iaccarino, Andrea Maffeis, Nadia Malaspina, Chiara Montomoli, Marcello Natalicchio, Alessandro Petroccia, Fabio Massimo Petti, Fabrizio Piana, Franco Rolfo, Licia Santoro, Mario Tribaudino, Alessandro Zuccari.

*ABSTRACT BOOK EDITORS*

Bernardo Carmina, Lorenza Fascio, Giulia Innamorati, Marco Pasero & Fabio Massimo Petti.

*COVER IMAGE:*

Aerial cityscape image of Turin during sunset.

*Papers, data, figures, maps and any other material published are covered by the copyright own by the **Società Geologica Italiana**.*

***DISCLAIMER: The Società Geologica Italiana, the Editors are not responsible for the ideas, opinions, and contents of the papers published; the authors of each paper are responsible for the ideas opinions and contents published.***

***La Società Geologica Italiana, i curatori scientifici non sono responsabili delle opinioni espresse e delle affermazioni pubblicate negli articoli: l'autore/i è/sono illi sololi responsabile/i.***

## The effect of natural fibres on geopolymers made using Mt. Etna volcanic ash as precursor

Zafarana S.E.\*, Occhipinti R. & Mazzoleni P.

Dipartimento di Scienze Biologiche, Geologiche e Ambientali, Università di Catania.

Corresponding author e-mail: [sabrinazafarana@yahoo.it](mailto:sabrinazafarana@yahoo.it)

Keywords: geopolymer composites, volcanic ash, natural fibres.

In the last years the awareness of environmental issues has led to the development of eco-friendly materials that could combine high performance products with the possibility of the re-use of waste materials in both construction and restoration field (Barone et al., 2020).

For Catania the disposal of a large amount of volcanic ash produced by Mt. Etna is seen as a problem. The possibility to turn a waste material into a resource could be a substantial benefit (Barone et al., 2021; Occhipinti et al., 2022). Moreover, the city is located on an active seismic zone so high-quality construction materials are required.

Alkali activated materials have favourable properties such as low curing temperature, recyclability, low cost of the precursors, thermal stability and low density, making them a valid alternative to traditional OPC. Despite these excellent qualities their brittle behaviour imposes constraints in structural design.

To enhance the strength of the geopolymer matrix, both organic and synthetic fibres can be added to the binders to improve mechanical properties (Aydın & Baradan, 2013).

Two types of organic fibres in different length and amount, were used to reinforce Mt. Etna volcanic ash-based geopolymers.

Flexural and compressive strength tests were carried out to compare the mechanical properties of geopolymer composites by using different types of fibres. Moreover, samples were analysed by electron microscope to evaluate the gel formation and the adhesion of the geopolymer matrix to the fibres net.

Preliminary results have shown that the addition of fibres enhances the flexural properties and reduces the shrinkage of the system.

*This research, funded by the PNR "Advanced Green Materials for Cultural Heritage" project, aims to develop natural fibre-reinforced geopolymers for retrofitting seismic areas.*

Aydın S. & Baradan B. (2013) - The effect of fiber properties on high performance alkali-activated slag/silica fume mortars. *Composites Part B: Engin.*, 45, 63-69.

Barone G., Caggiani M.C., Coccato A., Finocchiaro C., Fugazzotto M., Lanzafame G., Occhipinti R., Strocio A. & Mazzoleni P. (2020) - Geopolymer production for conservation-restoration using Sicilian raw materials: feasibility studies. *Mater. Sci. Engin.*, 777, 012001.

Barone G., Finocchiaro C., Lancellotti I., Leonelli C., Mazzoleni P., Sgarlata C. & Strocio A. (2021) - Potentiality of the use of pyroclastic volcanic residues in the production of alkali activated material. *Waste Biomass Valor.*, 12, 1075-1094.

Occhipinti R., Caggiani M.C., Andriulo F., Barone G., de Ferri L. & Mazzoleni P. (2022) - Effect of atmospheric exposure on alkali activated binders and mortars from Mt. Etna volcanic precursors. *Mat. Lett.*, 315, 131940.