

Title: Pozzolanic geomaterials: Phlegrean *pozzolana* in comparison with other volcanoclastic materials with pozzolanic activity

Tutor: Prof. Piergiulio CAPPELLETTI

Co-tutor(s): Dr. Concetta RISPOLI

Proposal

Geologically, pozzolana *sensu strictu* is represented by the incoherent facies of Neapolitan Yellow Tuff related to the 15.4 Ky eruption of the Campi Flegrei, and consists of volcanic ash, poorly vesiculated magmatic scoriae and lithic fragments. Other products of the TGN eruption, i.e., crushed zeolitized tuffs (containing phillipsite and chabazite), resulting from volcanic ash lithification processes (de Gennaro et al., 2000), have also been used in the past for the preparation of concretes, both as aggregates and presumably with similar functionality to pozzolana *s.s.*

Currently, the term pozzolan refers to poorly coherent, silica- and alumina-rich reactive materials of volcanic origin, mainly of pyroclastic origin. In the production of mortar-based materials, once mixed with water they interact with slaked aerial lime (portlandite), inducing the dissolution of the aluminosilicate phases to generate a series of calcium-based reaction products (hydrated calcium silicate C-S-H, hydrated calcium aluminate C-A-H and hydrated calcium aluminosilicate C-A-S-H) structurally akin to the mineral phases found in natural hydraulic lime and modern cement.

In addition to the "traditional" volcanic pozzolans reported by Roman authors (*harenae fossiciae*, generally identified with volcanic ash from the eruptions of Latium's volcanoes (Vulsini, Vico, Sabatini, and Colli Albani), archaeological evidence has shown that other volcanic products (lavas, obsidians, perlites) were exploited in the provinces of the Empire to produce mortar-based hydraulic materials.

Research Program

The doctoral program will have a multidisciplinary character in mineralogical petrographic and technological fields.

The project will involve 1) the study and in-depth characterization of Phlegraean materials with pozzolanic activity used since Roman times; 2) The comparison of the mineralogical-petrographic characteristics with other existing natural pozzolanes (e.g., Latium, Greece) 3) the technological characterization of the materials identified, in collaboration with DiCMaPI (UniNa).

The analytical program will be carried out using the facilities of DiSTAR of the University Federico II, where the PhD student will have the opportunity to acquire technical skills related to mineralogical, petrographic and physical methods, including

qualitative and quantitative mineralogical analysis (XRPD), chemical analysis (XRF), polarized light optical microscopy (POM), scanning electron microscopy with microanalysis (EDS/WDS), spectroscopic techniques (Raman, FT-IR) and thermal analysis (TGA).

"Doctoral School" training courses will be available for the doctoral student at the host university to enhance his or her knowledge on various topics. The work program includes a period of about 5 months to be held in a research facility or University location abroad, to enable the Ph.D. student to learn different analytical methods and compare with other scholars, also in order to have the opportunity to further develop his or her career.

Funding on Tutor's availability

=====