The behaviour of amorphous silica-rich rocks as cementitious additives in screed mortars

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The aim of the present study is to test Greek amorphous silica-rich rocks used as partial replacements of cement [25 and 50%] in cement mortars. The raw materials studied were diatomite rocks occurred in Zakynthos, Milos and Samos islands, and tuffite located in Milos Island. Cement substitutes participated in screed materials in percentages of 5% and 10% of the total dry mass. The raw materials were characterised chemically, mineralogically and technically. Microstructural analysis of raw materials and screed pastes was performed in order to specify reactions of silica phases in hydrated systems. The relationship between reactive silica of raw materials and compressive and flexural strength of the final products was also investigated. Properties of final products were examined and compared with commercial one. The water demand of pastes was increased by the addition of the siliceous raw materials, whereas their compressive and flexural strength was decreased. Conclusively, the siliceous rocks studied can be used as partial substitutes of cement in mortars only in ratios raw materials/cement lower than 1/2.

Archaeo-geophysical investigations in Acmonia Antique City (Western Turkey) using magnetic methods

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The location of the Acmonia Antique City is situated near Banaz-Uşak in the west of Turkey. It is claimed that Acmonia was founded at B.C. IX century by Phrygians. Akmonia had been in a state of economic prosperity since it is located on the "Royal Road" connecting the cities of Sardes, Susa and Persepolis.

In archaeological sites, there are buried objects such as walls, metals, grave jars and burnt ceramics. Buried burnt objects can acquire their magnetization at the time of earth's magnetic field. Thus, magnetic surveying was carried out in the Acmonia Antique city in five selected areas to locate buried materials. Magnetic method effectively detects the locations of these buried objects. Magnetic data acquisition in archaeological surveys can be performed by accurate magnetic gradiometer instruments.

Magnetic data were collected using gradient measuring technique in the archaeological area. The main goal of the present gradiometer survey is to detect the ancient remains as well as other archeological features which can be found in such historical areas. Our gradiometer measurements were carried out by using Geometrics G-856 gradiometer having a resolution of 0.1 nT at a 1 m. sampling intervals. The detectors measure the vertical vector of the magnetic field and the instrument displaying unit shows the gradiometer reading between the lower and the upper detectors. If there are magnetic materials such as iron artefacts or fireplaces in the ground, the magnetic field strength shows the higher value at the lower detector than the upper one, because the magnetic field decreases quickly with increasing distance from the source. This gives a positive reading in gradiometer measurements.

In the Acmonia antique city, pure magnetic and gradiometer data were collected at totally 1908 points. Obtained data were processed and mapped by using signal and image processing techniques. The processing was carried out by MagMap 2000 software programme.

Although appearance of the magnetic anomalies gives some ideas about buried objects in the subsurface, the advanced spectral methods were applied to the magnetic anomalies in order to identify subsurface objects such as walls, metals, grave jars and burnt ceramics. The residual magnetic anomalies mostly orientated in the N-S direction, implying the presence of remanent magnetization. RTP (Reduction the Pole) transformation could not entirely remove disoriented polarities arising from the effect of remnant magnetization. Therefore, analytical signal technique decreases the distortions caused by the remanence effects. The analytic signal of the magnetic anomalies was calculated to delineate the source fields of these anomalies. The boundaries of the various archaeological features can be identified based on the analytic signal of the magnetic data. The magnetic signatures were appeared to be well correlated with the walls, metals, grave jars and burnt ceramics. Results of this magnetic survey can be used to guide the archaeologist and give some ideas about the planning of an excavation in the future, and so provides decreasing the cost and time for excavation.

Geological settings and conditions of genesis of volcanogenic deposits of non-ferrous metals in Paleoisland arc environments

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By the example of the Pontian-South Caucasian paleoisland arc actively functioning during the whole Mesozoic the authors consider the main peculiarities of spatial-temporal relationships between ores of non-ferrous metals and enclosing rocks, and discuss the conditions of the evolution of ore-magmatic systems. The authors' conclusions are substantiated by data on $^{87}Sr/^{86}Sr$ ratios, concentration of rare elements in enclosing volcanogenic rocks, isotopic ratio of sulphur and oxygen in ores, and results of thermobarogeochemical studies. The authors hold the opinion shared by many mining geologists that the main part of ore components in non-ferrous metal deposits was extracted from nearby magmatites enclosing and underlying mineralized zones. The solutions from which ores precipitated were, by their salinity, very close to sea water. The maximum temperature of ore formation at epigenetic deposits reached 400°C for copper ores and 280°C for barite-polymetallic ores, whereas the pressure did not exceed 200 bar. As for hydrothermal-sedimentary ores, they could most likely form at the sea bottom, at depths of 2-3km and maximum temperature no more than 300°C.