Petrogenesis of Pan African Dokkan Volcanics of the Northeastern desert, Egypt: Mineralogy and geochemistry considerations

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The volcanic activities in the Eastern Desert of Egypt were formed by two major magmatic episodes at two different periods of time. Dokkan Volcanics is the main component of the younger episode started about 600Ma and continued for several decades. Lithologically, these volcanics have been found to vary from basalt to andesite to dacite. Field, mineralogy and geochemical data were used to test these variations and envisage their tectonic genesis, particularly at Esh El Mellaha area.

Dokkan volcanics form a consistent compositional spectrum with a wide range of SiO_2 (43.62-63.91 wt.%), CaO (2.34-10.56 wt.%), Sr (494-906 ppm), Zr (124-304 ppm) and are moderately enriched in incompatible elements. The fractionation index (FeO_{total}/ MgO) increases gradually from basalts through andesites to dacites (2.71, 2.88 and 3.80 respectively). These chemical variations support the idea that a fractional crystallization process has played a major role during the evolution of the Dokhan volcanic magma series. The enrichment of LILE (Sr, K, Rb and Ba) and the relative depletion of HFSE (Zr, P, Y, Ti) seem to be inherited from a mantle source. Manipulating these data with field relations and mineral phases verified three magmatic assemblages comprising tholeiitic basalts, calc-alkaline andesites and dacites. Tectonically, these assemblages postulate a transitional development between island arc and active continental margin volcanics in a subduction related tectonic environment.

Structural analyses of Bentonite under high pressure and high temperature

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The thermal stability of bentonite is of particular interest for containment barrier in nuclear waste storage facilities. However, very little is known about the stability of bentonite under high-pressure (HP) and high-temperature (HT) conditions. The goal of this work is to investigate the stability of the bentonite structure under HP and HT conditions using Fourier transformed infra-red (FTIR) *in situ* measurements on diamond anvil cell (DAC), and X-ray diffraction (XRD) measurements after the HP and HT processing on thoroidal chambers. The HP-HT experiments were performed in thoroidal chambers (Process A, B and E) and HP experiments were also performed using the DAC (Process C and D). The sample, calcium bentonite, was characterized by FTIR, XRD and X-ray fluorescence. Table 1 shows the HP/HT processing conditions. For experiments A and B the results of FTIR and XRD analyses showed no differences in the bentonite structure from the original sample. In the experiment C, FTIR analyses show that the bentonite structure is stable with a reversible deformation in the Si–O bond and experiment D show that bentonite did not lose water. For experiment E the result of FTIR analyses show changes in the chemical bonds and the XRD analyses for this experiment are in process.

Process	Pressure (GPa)	Temperature (°C)	Time (min)
A	7.7	25	30
B	7.7	200	90
C	7.7	25	-
D	12.66	25	-
E	7.7	1000	210

Table 1.