Geophysical Research Abstracts
Vol. 20, EGU2018-254, 2018
EGU General Assembly 2018

Low Temperature Alteration of Zelve Ignimbrite (Cappadocia) Under Experimental Conditions

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Zeolites have emerged when Cronstedt (1756) first described stilbite minerals. Zeolites have been introduced as a new mineral class in the scientific world as aqueous aluminosilicate minerals containing alkali and alkaline earth elements. From 1777 to 1800, various researchers found that adsorption, cation exchange and dehydration of zeolite minerals and so on. Zeolite group minerals are common aluminosilicate phases that are formed by recrystallization (devitrification) of volcanic ashes by losing its glassy features in alkaline aqueous environments. Zeolites are often found in industrial applications due to presence of organized voids in their crystal structures. However, especially needle-like zeolites (e.g. Erionite) are known to pose a serious health problem for people living around rock masses that contain these kinds of minerals. Within the scope of alteration properties of Cappadocia ignimbrite, which is the main topic of the project, juvenile glass slivers belonging to this ignimbrite were reacted under controlled conditions with alkaline solutions in order to determine the chemistry and formation conditions of the active agents which are effective in the formation of Zelve ignimbrite, Zeolite minerals formed as a result of devitrification were investigated. Experimental work carried out in this context includes examining the chemical reaction products occurring in the Parr reactor for 8 hours at 150 ˚C under hydrothermal conditions and autogenous pressure. At the end of the hydrothermal processes, the resulting products were characterized by X-Ray Diffraction (XRD) and characterized by Scanning Electron Microscope-Energy Diffraction X-Ray Spectroscopy (SEM-EDS). Zeolite materials, such as Na-K phillipsite ((Na, K, $Ca_{0.5}$, $Ba_{0.5})_{4-7}[Al_{4-7}Si_{12-9}O_{32}].12H_2O$), analcime ($Na(AlSi_2O_6).H_2O$) and other synthetic zeolites were synthesized from ash size volcanic glass fragments of Zelve ignimbrite in presence of NaOH, KOH and $NaHCO_3$ as activating agents. This study reveals that alkaline solutions like NaOH, KOH and $NaHCO_3$are the most important controlling factors on the zeolitization of the widespread Zelve ignimbrite of the Cappadocia.

Keywords: Alteration, Ignimbrites, Zelve, Zeolite, Cappadocia