

## **ZEOLITIZED VOLCANICLASTIC MATERIALS FROM GREECE TO BE USED IN TACKLING ENVIRONMENTAL PROBLEMS**

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The investigation of a series of volcanoclastic deposits from various places in Greece proved that the matrix of these materials has been greatly altered to a variety of authigenic zeolite and clay minerals. The formation of such mineral types within volcanoclastic materials is the result of the alteration of volcanic glass. Zeolitized materials from various deposits in Northern Greece and the Santorini, Milos, Kimolos, Polyegos, and Samos Islands were examined. By using XRD, SEM and EPMA it was shown that the dominant zeolite mineral is either clinoptilolite or mordenite. Materials containing up to 80% of zeolite minerals were identified. Smectite, occasionally illite/smectite is the dominant clay mineral. Opal-CT, cristobalite, quartz, kaolinite, feldspar, amphibole, Fe-Ti oxides, biotite and halite often complete the mineralogy of these materials.

The cation exchange capacity (CEC) is one of the most important property of zeolites. CEC results from the presence of loosely bound cations in the structure of the zeolites which are easily exchanged when the zeolites come in contact with solutions of “saturating” or “indexing” ions. The CEC of the zeolitized materials was measured using the ammonium acetate saturation method. The obtained CEC values exceeded 200 meq/100 g in some cases.

So, the composition, purity and high CEC value of zeolitic materials from certain deposits indicate that the Greek zeolitic materials could have numerous applications with respect to the environmental protection area. They can be effectively used **a)** to remove  $\text{NH}_4^+$  and phosphate from various types of wastewaters such as municipal effluents, wastes from urban landfills, animal sewage, and other agricultural and aquacultural effluents; **b)** to remove heavy metals such as Pb, Cd, Zn, and Cu from industrial waste effluents; and **c)** to be added to clay-based (with relatively low CEC) liners of waste repositories, in order to enhance the total CEC of the liner and, thus, its retardative properties.