# Application of zeolite synthesized from fly ash for the removal of Mn from aqueous solution

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In the last few years many water purification processes have been developed and most of them are based on the utilization of low-cost materials with high pollutant-removal efficiency. Among these, natural zeolites are largely used due to their typical structural characteristics which facilitate pollutant absorption and encapsulation. Zeolite are microporous crystalline hydrated aluminosilicates with a three-dimensional network of tetrahedral (Si, Al)O4 units which form interconnected tunnel and cages. Each aluminium ion that is present in the zeolite framework yields a net negative charge, which is balanced by an extra framework cation. The porous zeolite is host to water molecules and ions positive charge and the ability to exchange cations is one important property of them. Basing on their similar structure and properties, synthetic zeolites replace the natural ones in many applications. These minerals can be synthesized from different source material and fly ash, a by-product of coal combustion waste, represents one of most used.

In this study, column and batch experiments were carried out in order to study the performance of zeolites synthesized from fly ash at low temperature (Belviso et al., 2010a; b) for the removal of Mn. This heavy metal is very diffuse in the aqueous solution due to the increasing industrial and agricultural activities, and its high concentration in the environment represents a serious problem because it is not biodegradable, tending to accumulate in living organisms and causing various diseases. Moreover Mn is an abundant natural element in the Earth crust and its presence in groundwater also depends from the natural leaching processes that vary widely depending on the rock types.

In order to fix the minimum zeolites dosage for maximum Mn removal under realistic flow-through conditions, column experiments were carried out by using different amounts of zeolitic material ranging from 10 to 60 g with solutions containing heavy metal concentration of 10 mg/L. Batch adsorption studies were also conducted to determine the effect of the contact time on the removal of the studied pollutant element.

The results indicate that synthetic zeolitic material shows a substantial ability to remove Mn from contaminated aqueous solution. The Mn concentration already decreases when using 10 g of zeolite. The results also indicate that the amount of Mn removed from solution do not change significantly with the increasing amount of zeolite and the sorption process already occurs within the first minutes of contact with the contaminated solution.

**References**

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