



A new method for the removal of ammonium from drinking water using hybrid method of modified zeolites/catalytic ozonation

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ABSTRACT

Ammonia in the form of ammonium ion is toxic and could decrease the dissolved oxygen in water and endanger the aquatic life. The aim of this study is the removal of ammonium using a new method of oxidation and adsorption by catalytic ozonation and clinoptilolite zeolite, respectively. The research method is an experimental study. First, optimal pH of ammonium adsorption on carbon catalyst (5 g/L), Garmsar and Firoozkooh zeolites and oxidation process were determined. Then, in catalytic ozonation process, the effect of other variables on ammonium removal efficiency such as the concentration of carbonic catalyst (0.5–50 g/L) and the reaction time were investigated. Then, the effect of retention time and adsorbent concentration on adsorption of the remaining ammonium and nitrate production by the oxidation process using zeolites and their modifications were determined. The results showed that optimum pH for the ammonium adsorption process by carbon catalyst, catalytic ozonation and zeolite were 8, 9 and 8, respectively. However, the optimum pH of 4 was determined for nitrate removal. The highest ammonium absorption capacity was related to natural Firoozkooh zeolite as 18.5 mg/g, and the effect of ligand and acid modification decreased the absorbed capacity by 12% and 14%, respectively. The highest nitrate removal efficiency was related to Garmsar ligand modified zeolite (98%) and an absorption capacity of 11.2 mg/g. In the catalytic ozonation process/absorption process, the concentration of ammonium was decreased to 0.6 mg/L. This method effectively eliminates ammonium, and the modification of zeolite with cationic surfactant increased the efficiency of nitrate removal and therefore the concentrations of all pollutants were below standards.

Keywords: Adsorption; Ammonium; Catalytic ozonation; Clinoptilolite; Nitrate; Water; Zeolite

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