

以不同氧化劑處理地下水中鐵錳之研究

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摘要

地下水含有鐵、錳二項物質是非常普遍的，鐵、錳在淨水程序上若未能完善處理，於配水系統中會造成微生物的滋長與生物膜的形成，使管線阻塞，此外鐵、錳亦會消耗水中的餘氯降低殺菌力，將於供水時引起細菌的再污染與色度、臭味等問題產生。鐵、錳在飲用水水質標準中的規定值分別為 0.30 與 0.05 mg/L 以下。本研究以次氯酸鈉(NaOCl)、高錳酸鉀(KMnO₄)、綜合氧化液(MIOX)作為氧化劑，針對含鐵、錳原水，於不同操作條件下進行氧化試驗，再以 0.45 μm 的薄膜過濾並搭配 SEM/EDS 觀察鐵、錳氧化物與組成份。研究結果發現鐵、錳相較之下，鐵的氧化比較容易，反觀錳的氧化不易，受到 pH 值影響為最大，pH 8.0 以上對於錳的氧化有正面效果，當鐵、錳共存於原水時，錳的去除效率高過於原水中單獨錳時，推測鐵、錳共存於原水時，鐵、錳產生共沉降與吸附氧化現象來達到錳的去除。使用 KMnO₄ 為氧化劑時，過高的加藥量會導致錳的殘餘濃度增加，以 MIOX 作為氧化劑時，劑量 5 mg/L、pH 值在 7.0~9.0，反應時間需達到 30 分鐘以上，才能讓鐵、錳達到法規標準之要求。在 SEM/EDS 觀測濾紙上的沉澱物中發現，薄膜表面錳氧化物的組成比例有增加之趨勢，表示氧化效果越佳，此結果也可由殘餘錳濃度相互印證。

Abstract

It is a common phenomenon that the existence of iron and manganese in groundwater for drinking water treatment. The iron and manganese will reduce disinfectant such as chlorine in water, therefore, the bacteria and biofilm will regrow in the water distribution pipe system if the iron and manganese were not treated properly in water treatment plant. As concentration of Fe and Mn in water are excess, the water becomes red-brown, and probably blockade water pipes in water supply system. In order to avoid these problems, the standards of drinking water quality in Taiwan are extremely strict, Fe is less than 0.3 mg/L and Mn is less than 0.05 mg/L.

In this study, NaOCl, KMnO₄ and MIOX were used to perform oxidation test under different operating conditions for two different iron and manganese concentrations source water. The oxidation sample was filtrated with 0.45 μm membrane and permeate was measured. Solid on the membrane from the iron and manganese oxidation was analyzed with SEM/EDS. The results show that iron oxidation reaction is faster than manganese. The oxidation of manganese is strongly correlated with pH. When pH value is higher than 8, the oxidation of manganese showed the positive effect.

The manganese filtration removal efficiency is higher with the existence of iron than only manganese in the source water. It is estimated that iron and manganese co-precipitation to enhance