Analysis on the Influencing Factors of Iron and Manganese Content in Shallow Groundwater in the Water Source-Area near the Feng River in Xi'an

Zhuoran Wang[1*], Xiaoguang Zhao[1], Wenjie Nie[1], Huadong Du[1]

1 College of Geology and Environment, Xian University of Science and Technology, Xi'an 710054, China

Corresponding author: Zhuoran Wang, sxbxylz@163.com, +8618791408020

ABSTRACT: Iron and manganese ions, as the main contribution indicator of super-class III shallow groundwater in the western suburbs of Xi'an, seriously threaten the safety of local water supply and the health of residents. Based on data collection and hydrogeological survey, this paper studies the concentration of iron and manganese in groundwater by collecting and analyzing 52 groups of groundwater samples, and analyzes the possible sources of iron and manganese in consideration of human factors such as hydrogeological conditions and surface pollution input. The results showed: (1) The highest iron content exceeded the Class III water quality standard by 1.03 times, and the highest manganese content exceeded the Class III water quality standard by 3.92 times. The water sample points exceeding Class III accounted for 9.5% and 26.2% of the total water sample points respectively. (2) The content of iron and manganese in the water of Feng River is 8.47% and 19.69% of the groundwater respectively. Therefore, the higher iron and manganese in individual wells near the source of Feng River have no obvious relationship with Feng River. (3) According to drilling data, the iron and manganese content in different rock masses is silty clay>round gravel>fine sand, medium-coarse sand, and the distribution of iron and manganese content is positively correlated. (4) In the experiment of the iron and manganese release law in the rock mass, it was observed that the iron and manganese in the overlying water experienced three stages of rapid increase, fall and stabilization. When the final release stabilizes, the release rate of manganese in the rock mass is higher than that of iron. The manganese content in the overlying water is 0.010~0.057mg/L, the release rate is 0.02%~0.05%, and the iron content is 0.004~0.023mg/ L, the release rate is less than 0.01%, and the higher pH in the water environment has a significantly higher inhibitory effect on the release of iron in the rock mass than manganese.

Keywords: Hydrogeochemistry; water pollution; Fe ion; Mn ion

1. INTRODUCTION

Water resources play an important role in promoting orderly economic development, ensuring the basic lives of urban and rural residents, and maintaining ecological balance. Surface water and groundwater are important components of water resources. Compared with surface water, groundwater is more widely distributed and requires less investment in mining and utilization. Especially in some arid and semi-arid areas, surface water resources are relatively scarce, and the role of groundwater is particularly obvious. In the development and utilization of groundwater, the riverside groundwater source has sufficient water quantity and good water quality, so riverside mining has become an important method of groundwater utilization.

In recent years, due to the intensification of human activities, the impact on groundwater is increasing and the dependence is increasing. While developing and utilizing groundwater resources, we are facing one of the most serious problems-groundwater pollution. Groundwater