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STUDY ON CLOGGING PREVENTION IN OPEN LOOP HEAT PUMP SYSTEMS DUE TO IRON REMOVAL FROM GROUNDWATER

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Abstract

Open loop heat pump systems (OLHPS) are valid methods for energy storage and groundwater management due to their high efficiency and low costs. Nevertheless, clogging occurs when injecting water into the aquifer. Iron in groundwater is the primary cause of chemical clogging because of its elusive chemistry due to contact with oxygen. Expensive iron removal methods in practice impel us to explore alternative cheap and eco-friendly materials for iron removal from groundwater, which are also practicable in developing countries. In the present study, wooden charcoal was applied as a filter material for column experiments and compared to fine sand and volcanic ash in order to evaluate the filtering potential of the material. The column experiments were conducted in an upward flow mode by minimizing oxygen contact with water. Among three different filter materials tested, wooden charcoal showed highly effective retention potential compared to fine sand and volcanic ash. The maximum obtained adsorbed iron content was 3.5 g iron per kg dry charcoal under different flow rates. The experimental results may contribute to a filter design for practical application in OHLPS in order to remove iron from groundwater.

Key words: chemical clogging, dissolved iron removal, retention, wooden charcoal

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