Contribution ID: **824** Type: **Poster Presentation**

Study on mechanism of removal of residual DNAPL by co-injection of ethanol and CO2 into 2D porous micromodel

Thursday, 16 May 2024 10:20 (1h 30m)

Groundwater contaminated with dense non-aqueous phase liquids (DNAPLs) such as chlorinated hydrocarbons is difficult to remediate, and the effectiveness of conventional pump treatment techniques is very limited due to its low contaminant solubility. Enhanced in-situ flushing has attracted widespread attention as an alternative to the use of flushing fluid such as cosolvent and gas co-injection. It is very important to understand the recovery mechanism of cosolvent and gas co-injection into polluted aquifers to improve the recovery efficiency of polluted aquifers. In this study, the removal process of residual PCE in a two-dimensional (2D) micromodel that is used to represent the porous media with different concentrations of ethanol + CO2 and different flushing rates was observed by using a camera at room temperature and pressure, and the removal mechanism of DNAPLs under cosolvent + gas co-injection was preliminarily understood. Firstly, it was verified that increasing the concentration of ethanol solution could increase the dissolution rate of ethanol to PCE and promote the dissolution of residual PCE. Secondly, when the ethanol solution and CO2 were co-injected into the micromodel, the residual PCE in the injected CO2 flow channel migrated out of the micromodel, which also changed the distribution of PCE, but did not reduce the interface area between PCE and flushing solution in the pore channel. It is well known that the interfacial area is proportional to the dissolution rate, which means that the injected gas does not inhibit the dissolution of the ethanol to the PCE, so the remediation efficiency of the contaminated aquifer can be significantly improved. In addition, a small fraction of PCE remains in contaminated aquifers that are troubles to remove in the small pore channels or the dead end channels, and are hard to completely repair with only cosolvent flushing. In the case of co-injection of ethanol solution with CO2, CO2 cannot enter these channels, but the ethanol solution can be sent into these channels to contact with PCE, promote the dissolution of PCE, and thus improve the removal rate of PCE in the aquifer. Finally, different experiments were compared, and it was found that when the injection flushing rate ratio of 60wt% ethanol to CO2 was 1:2, the removal rate of DNAPLs could be improved in a short time, and the amount of cosolvent could be saved, so as to obtain the best remediation scheme, which is of great significance for rapid repair and cost saving in the actual field.

Acceptance of the Terms & Conditions

Click here to agree

Student Awards

I would like to submit this presentation into the MDPI student poster award.

Country

中国

Porous Media & Biology Focused Abstracts

This abstract is related to Porous Media & Biology

References

Conference Proceedings

I am not interested in having my paper published in the proceedings

Primary author: Dr YUAN, Min (School of Environmental Studies, China University of Geosciences, Wuhan 430078, China)

Co-author: Prof. GUO, Huirong (School of Environmental Studies, China University of Geosciences, Wuhan 430078, China)

Presenter: Dr YUAN, Min (School of Environmental Studies, China University of Geosciences, Wuhan 430078, China)

Session Classification: Poster

Track Classification: (MS06-A) Physics of multiphase flow in diverse porous media