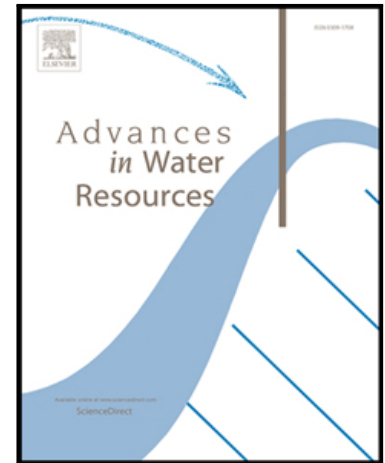


## Accepted Manuscript

A Random Walk Solution for Modeling Solute Transport with Network Reactions and Multi-Rate Mass Transfer in Heterogeneous Systems: Impact of Biofilms

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**Highlights**

- We develop a numerical method to model reaction network and multi-rate mass transfer.
- The method can account for heterogeneity in the flow and reaction parameters.
- We analyze the importance of biochemical reaction in the immobile domain.
- Reaction in the immobile zone can lead to higher daughter products concentrations.

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