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Dolomite dissolution is not an attractive alternative for meeting Ca^{2+}, Mg^{2+} and alkalinity criteria in desalination plants' post treatment step

Ori Lahav*, Paz Nativ, Liat Birnhack

Faculty of Civil and Environmental Engineering, Technion – Israel Institute of Technology, Haifa, 32000, Israel, email: agori@cv.technion.ac.il (O. Lahav), 2nd affiliation: Guangdong Technion Israel Institute of Technology, Shantou, China

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ABSTRACT

Dolomite dissolution is often mentioned as an option for post-treatment of desalinated water for supplying calcium, magnesium and alkalinity to the product water and comply with non-aggressiveness criteria. This paper uses reliable literature-based dolomite dissolution data to compute and discuss various options for utilizing this process to meet two common sets of desalinated water quality criteria. Alkalinity mass-balance was performed to corroborate literature-data correctness. Discussion shows that CO_2-enhanced dolomite dissolution is impractical due to slow dissolution rates encountered at the relatively high pH values induced by the CO_2 dosage, resulting in low Mg^{2+} concentrations at reasonable retention time. In the H_2SO_4-enhanced dolomite dissolution the main difficulty arises from the low alkalinity value attained in the water following its blending with raw desalinated water. This, in turn, necessitates very high NaOH dosages to meet required alkalinity and LSI. At relatively low H_2SO_4 dosages, the post-dilution alkalinity value can be increased, but at the expense of treating the majority of the desalination plant flow, resulting in excessively-high dissolution-reactor volumes. The overall conclusion is that dolomite dissolution is markedly inferior (cost- and quality-wise) to competing Mg^{2+} addition alternatives, including simple dissolution of off-the-shelf chemicals, such as $MgSO_4$.

Keywords: Dolomite dissolution; Post treatment; Desalination; Water quality criteria; Magnesium

*Corresponding author.

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