

Discussion

Comments on “Reply to Comments on Comparison of reductive dechlorination of *p*-chlorophenol using Fe⁰ and nanosized Fe⁰”, by Wang and Cheng [J. Hazard. Mater. 150 (2008) 850–851]

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It is unclear as to whether Wang and Cheng’s reply [1] actually addresses the specific criticisms made in the comments [2] on their article [3]. Although the authors said that they do agree with enumerated viewpoints, their reply seems to be limited at justifying their experimental conditions: the used mixing intensity and iron (Fe⁰) loading.

The comments [2] should have certainly more carefully considered the *R*-values in relation with the specific objective of the individual experiments. Nevertheless, it should be pointed out that even though the actual reaction stoichiometry may be difficult to access, an adequate assumption can be made. For example by considering Fe⁰ as the sole contaminant reducing agent and balancing the redox equation for complete contaminant reduction. Another remark concerns the fact that procedures that are currently/usually used are not always practical. This is true in particular for using the same mass of Fe⁰ in excess and for mixing the reacting systems. It is the challenge of scientific research to identify disturbing factors and eliminate/consider them for better process understanding.

Considering the effect of mixing operations it is clear that any mixing intensity above natural turbulence is too vigorous. Mixing disturbs processes of oxide-film formation [4], might keep particles (in particular generated corrosion products) suspended [5], and obviously accelerates Fe⁰ oxidation. Mixing should be therefore regarded as a relevant disturbing factor in investigating the process of contaminant removal in Fe⁰–H₂O systems. With this in mind the critical value of 40 rpm

in Choe et al. [6] can be regarded as the value above which iron oxide precipitation reached a sort of steady state regime or a pseudo-equilibrium. Such an equilibrium is dynamic, thus (i) Fe⁰ dissolution and (ii) iron oxide precipitation occur with the same kinetics. Rigorously, there is no reason to assume that the plateau reached for mixing intensities >40 rpm in ref. [6] will not change with increasing mixing intensity (>100 rpm). Therefore, referencing Choe et al. [6] while justifying the use of an mixing intensity of 150 rpm may be an unacceptable extrapolation.

Lastly, knowing the specific surface area of both Fe⁰ (0.9 m²/g) and nano-Fe⁰ (35 m²/g), and their individual average diameters [3], the Fe⁰ mass to be used can be calculated and used as proposed in ref. [2]. Moreover, the cross section (surface occupied by a single molecule) of the contaminant (here *p*-chlorophenol) should be given/estimated [7] and used to achieve different extents of surface coverage (e.g. $\alpha = 0.25, 0.50, 0.75, 1.0, 1.5, 2.0$).

Wang and Cheng are thanked for their useful reply to the comments. This reply is considered as an helpful support in communicating the substance of the comments to the readers.

References

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