KMnO₄ chemical kinetics in high diluted solvents

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Background: A number of theoretical and experimental approaches have been signaling towards a induction of some solvent structural order or dynamical behavior, whenever a High Dilution (HD) is prepared. These works have been performed using different spectroscopic techniques, calorimetric studies, electrical and optical measurements, among others, which results are interpreted under many different approaches. The understanding of the physicochemical nature of HDs is still far from to be clarified, despite the evidences on their biological activity. Assuming that physicochemical changes induced by shaking and dilution (potentization) are true, one could expect that the changed solvent could interfere in the chemical kinetics of a complex reaction. The reduction of Mn⁷⁺ to Mn²⁺ (color change) observed when KMnO₄ is transferred into an acidic solvent is a self-catalyzed reaction dependent on pH, temperature and concentration with many reaction pathways, but converging usually to the colorless Mn²⁺ state (the Mn²⁺ produced in the Mn⁷⁺ reduction is the reaction catalyzer). **Method:** We have performed this reaction using oxalic and sulphuric acid as solvent, observing the time dependence of the absorbance at $\lambda = 525$ nm. Some solvent variants were proofed: G0: normal solvent; G1: potentized solvent at 12x; G2: Mn²⁺ potentized in normal solvent until 12x. If the potentization itself could change the solvent, we would expect differences in G1 compared to G0. If some Mn²⁺ information were imprinted into the solvent due the potentization we would expect differences in G2 to G1 and G0. It was recorded 10 spectra for each solvent variant and the experiment was performed twice (different weeks), with different fresh starting solutions (KMnO₄, acid solvent and variants). Averaged values and standart deviations were compared. **Results:** The only difference observed were a randomic time delay (few seconds) to start the decrease in the absorbance at $\lambda = 525$ nm. This delay was associated to the natural diffusion of KMnO₄ in the solvent and the time left to insert the cuvette into the spectrometer as well to turn the measurements on. After delay correction, all curves showed similar behavior (unsignificant differences), that its typical decrease. **Conclusion:** If potentization is able to induce changes in the solvent, these were not able to affect the chemical kinetics of the KMnO₄ in acidic medium. One could hypothetize this model is not responsive to those putative changes either by the unspecificity of a chemical solution (no similitude is achieved) or by the lack of a biological sensor able to interpret such changes. Another conclusion would be that no changes are induced on the solvent due potentization.

Keywords: KMnO₄, spectroscopy, chemical kinetics, solvent.

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Support: UNESP, IAESTE

Conflict of interest: authors declare there is no conflict of interest

Received: April 4th 2014; Revised: May 10th 2014; Published: June 30th 2014.

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How to cite this article: Vivian F, Zacharias CR. KMnO₄ chemical kinetics in high diluted solvents. *Int J High Dilution Res* [online]. 2014 [cited YYYY Month dd]; 13(47): 88-88. *Proceedings of the XXVIII GIRI Symposium; 2014 Jun 20-22; Sighisoara (Romania)*. GIRI; 2014; Available from: <http://www.feg.unesp.br/~ojs/index.php/ijhdr/article/view/738/699>