2C2a Magnetic Field Effects on Oscillating Phenomena

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Oscillating phenomena are of great interest as a basic model of life phenomena. In this paper, magnetic field effects (MFEs) on (1) salt-water oscillation and (2) cathodic potential oscillation of zinc electrode are presented.

Salt-water oscillation:[1] Influence of strong *vertical* magnetic field (≤13 T, 1300 $T^2 m^{-1}$) on salt-water oscillator, composed of salt-water and water, was studied. The oscillation period was 6.3 s (-1300 $T^2 m^{-1}$) and 2.7 s (+1100 $T^2 m^{-1}$), whereas it was 3.3 s at a zero field. This oscillator is driven by the earth's gravitational force at a zero field. In a magnetic field, it is driven by the sum of the gravitational and magnetic force (i.e., *effective* gravitational force). Fig.1 shows the dependence of oscillation period on the effective force. The period is curved concavely. To evaluate the effect of magnetic force semi-quantitatively, the oscillation was simulated. As shown in Fig. 1, observed results are in agreement with the simulated ones, indicating strongly that the magnetic force is the cause of the observed effect.

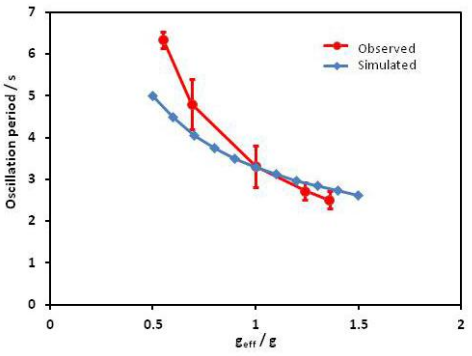

Fig. 1. Dependence of oscillation period on the effective gravitational force. g is the earth's gravitational acceleration and g_{eff} is the *effective* gravitational acceleration.

Cathodic potential oscillation of zinc electrode:[2] MFEs (0 - 0.46 T) on the cathodic potential oscillation of zinc cathode in an alkaline solution was studied. By applying magnetic field the oscillation period increased and the oscillation was quenched at 0.47 T. From *in situ* observation of the cathode during electrolysis, it was concluded that the solution convection induced by Lorentz force is the cause of the observed effects.

(1) Y. Tanimoto, C. Udagawa, R. Nishikiori, S. Morimoto, A. Katsuki, Y. Fujiwara, and R. Nakagaki, *J. Phys. Soc. Jpn.*, **81**, 094805 (2012).

(2) R. Nishikiori, S. Morimoto, Y. Fujiwara, and Y. Tanimoto, *Appl. Magn. Reson.*, **41**, 221 (2011).