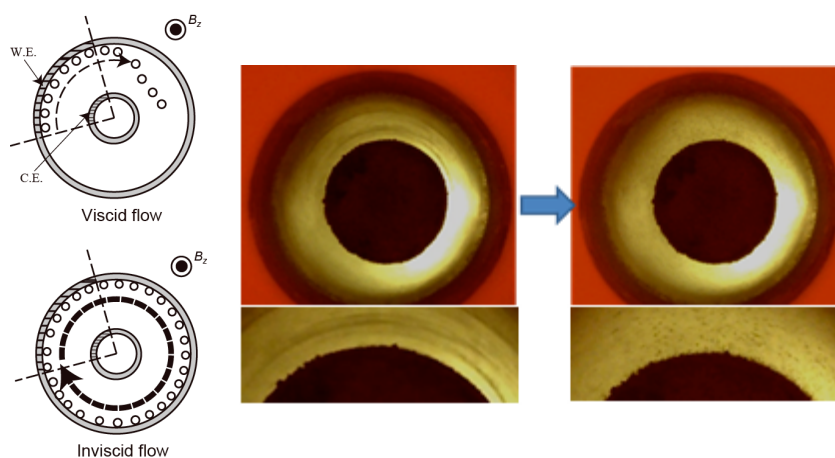


Ionic Vacancy Formed in Electrochemical Reactions under High Magnetic Fields

高磁場下における電気化学反応により生成するイオン空孔



Under high magnetic fields, the lifetime of ionic vacancy as well as the nanobubble formation in electrode reaction was measured. Ionic vacancy is a negatively or positively charged free vacuum space of the order of 0.1 nm, produced in liquid solution. However, it has been believed that the vacancy would be quite unstable. Using a concentric electrode system under a vertical magnetic field (cyclotron magnetohydrodynamic electrode, CMHDE), in ferricyanide/ferrocyanide redox-reaction, copper cathodic deposition and copper anodic dissolution, we have actually measured the lifetime. As a result, it was clarified that the lifetime is distributed from 1 ms to 1 s, corresponding to the intrinsic lifetime and the nanobubble formation time, respectively. Then, with the same type of electrode system, the microbubble globules evolved from the collision of nanobubbles were successfully observed.

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Reference: Y. Oshikiri, R. Aogaki, M. Miura, A. Sugiyama, R. Morimoto, M. Miura, I. Mogi, and Y. Yamauchi, "Microbubble Formation from Ionic Vacancies in Copper Anodic Dissolution under a High Magnetic Field", *Electrochemistry*, 83 (2015) 549.

溶液中における電極反応とともに生成するイオン空孔は、直径 0.1nm 程度の帯電した真空部分の周りを反対符号の電荷が取り囲んだ構造をもっており、室温で1秒ほどの寿命を持つ。このイオン空孔同士は高磁場中で MHD 流れにより衝突し(左図)、ナノバブルを経てマイクロバブルを生成する。フェリシアン/フェロシアンの Redox 反応系、銅の電析及び銅の溶解反応においてイオン空孔由来のマイクロバブルの可視化に成功した(右図)。

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