グローバル COE 物質科学イノベーション講演会

演 題：**3D Visualization of Material Degradation**

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要 旨：

Heterogeneous microstructures are intentionally developed in alloys during fabrication to achieve the desired mechanical properties. As a consequence, the alloys are susceptible to localized corrosion through galvanic coupling of compositionally differing regions. Such localized corrosion can provide potential sites for subsequent cracking, leading to potential catastrophic consequences and, therefore, has attracted intense attention over the last decades. However, many questions remain unanswered about the local microstructural criteria for the initiation and development of localized corrosion. To a degree, this is because microstructural information previously obtained by conventional two-dimensional (2D) characterization techniques is often inadequate for providing an accurate reflection of the true three-dimensional (3D) microstructure and associated localized corrosion.

In-situ optical microscopy and ex-situ X-ray/SEM tomography were employed to monitor and examine the initiation and propagation of localized corrosion in AA2024 aluminium alloy. The latter provides structural information that is previously unobtainable with conventional 2D techniques. Further, the combination of ultramicrotomy and low voltage scanning electron microscopy (LVSEM), with selective detection of backscattered electrons (BSE), significantly improved depth and lateral resolutions and atomic number contrast (Z-contrast) sensitivity, enabling high resolution tomography of localized corrosion. It was observed that localized corrosion is initiated at intermetallic particles. With the establishment of a corrosion front of low pH and chloride-enriched, localized corrosion can propagate away from the intermetallic particles in a different form by preferential attack of certain grain boundaries.

本講演は『化学研究先端講義／総合化学特別研究第二』の一部として認定されています

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