

Analysis of the Surface and the Cross Section of the Anodized Film of Niobium Oxide

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Anodized oxide films of so called ‘valve metals’ such as Al, Ti, Nb, etc. become dielectric film with various interference colors. Even though the study of anodized film of niobium oxide has progressed¹ recently, particularly from the viewpoint of application to electric condenser, its actual structure and physical properties have been not yet revealed completely. We analyzed the condition, structure, physical properties, the pH-dependence of electrolyte, and the process of generation of the corrosion due to the breakdown phenomena, using the foil and the wire of 99.9 % pure Nb and Nb-1mass%Zr metal. The various kinds of the surface and cross-section of the generated anodized film of niobium oxide have been analyzed using SEM, EPMA, AES, and XPS. EPMA color map analysis shows that the oxidizing components are Nb₂O₅ or NbO₂ in the area closer to approximately 0.9 μm from the surface which has a higher concentration of oxygen. On the other hand, the deeper layer could be the layer of NbO_x which was generated from the diffusions of O into niobium metal. (Fig.1) The corrosion of the surface is found to be largely dependent upon the pH of the electrolyte as well as the composition of the Nb metal. The breakdown phenomena take place easily in electrolyte with higher pH using pure Nb metal.

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[1] C. V. D’Alkaine, L. M. M. de Souza, and F. C. Nart, *Corrosion Science*, **34**, 109-115 (1993); *ibid.*, **34**, 117-127 (1993).

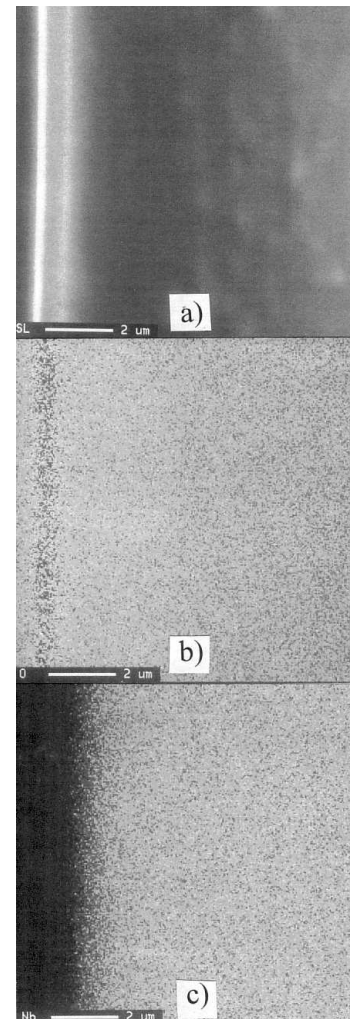


Fig.1. EPMA Cross-Section Analysis of Nb foil. a) SEM, b) O, c) Nb