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## Ellipsometric Investigation of Anodic ZrO<sub>2</sub> Films Formed in H<sub>3</sub>PO<sub>4</sub> Solutions

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By ellipsometric method the optical parameters and thickness of oxide films formed anodically on the Zr metal surface were investigated. The oxides were grown on the mechanically polished zirconium electrodes under potentiostatic conditions in 1 M H<sub>3</sub>PO<sub>4</sub> for the potential range between 0 and 60 V. From measured ellipsometric parameters  $\Delta$  and  $\Psi$ , at in-situ and ex-situ conditions, the complex refractive indices for both, metal substrate and oxide films were calculated. The reflectivities of the electrode surfaces were calculated too. The results shown in table 1 are in good agreement with those obtained by E.M. Patrito and V.A. Macagno [1].

Table 1 Complex refractive index and reflectivity for the substrate and oxide film

in-situ	ex-situ
$\tilde{n}_s = 2,54 - i2,93$	$\tilde{n}_s = 2,368 - i2,642$
$\tilde{n}_f = 2,09 - i0,0418$	$\tilde{n}_f = 1,97 - i0,0788$
$Ro_s = 0,424$	$Ro_s = 0,483$
$Ro_f = 0,718$	$Ro_f = 0,538$

On Fig.1 the thickness-potential profiles at in-situ and ex-situ measurements are shown. The curves on fig.1 indicate linear d-E dependences with change in slopes over the 10 V. The coefficient of anodization below 10 V is approximately 2 nm/V, and then decreases to 1,3 nm/V.

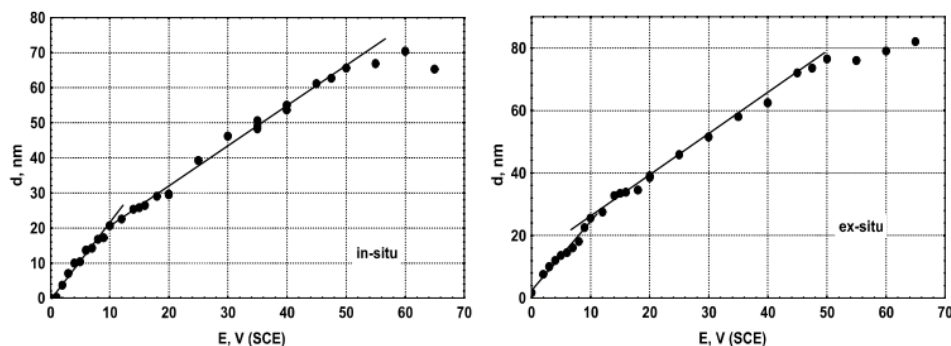


Fig.1. Thickness-potential curves for oxide grown in H<sub>3</sub>PO<sub>4</sub>

The anodic films formed at the potentials below 10 V are compact. Oxide films formed at the potentials above 10 V are porous.

1. E. M. Patrito and V. A. Macagno, *Journal of Electroanalytical Chemistry*, **371** (1994) 59-71