DISCUSSION

G. P. Sabol[1] *(written discussion)*—Although there are some differences in our observations, there are some striking similarities. Certainly your observation of a columnar morphology is in agreement with other observations and is encompassed in our model of film thickening. Secondly, the width of your columnar grains is approximately 500 Å (50 nm), which is the size reported in our work as the ultimate size attained after the first renucleation process has occurred. In addition, we both observe voids concentrated at the boundaries throughout the bulk of the post-transition film. Furthermore, we report that the discrete pores formed at boundaries ranged in size up to 70 Å (7 nm), and those at triple points were as large as 300 Å (30 nm). These dimensions are very similar to those of the pores that you observed. A rough measurement of the pores in your photographs indicate that the long pores along the grain boundaries are approximately 25 to 100 Å (2.5 to 10 nm) in width and those larger pores nearly perpendicular to the direction of columnar growth are as large as 200 to 300 Å (20 to 30 nm). I believe, therefore, that the structures observed are more similar than different, and that the chief difference is the angle of observation relative to the growth direction. According to our model, you would not see the region of rapid grain coarsening to the 3000 Å (300 nm) diameters until you were within 6 μ m or less of the outer surface. Were you able to make any observation in this region?

A. W. Urquhart and D. A. Vermilyea (authors' closure)—In our film preparation technique it is usually not possible to determine how far a given point of observation is from the outer oxide surface. Therefore, we can neither confirm nor disprove your prediction of a region of large oxide grains at about 6 μm from the surface.

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