

Continued from "Bogus Beryllium" (Sept. '04 VC, p. 24).

SPOTLIGHT

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Bogus Beryllium

The SEM image in *Fig. 2* shows two major areas. There is the dark coating that is flaking off and a lighter colored surface that is mottled underneath. EDXA spectra using 10kV beam voltage show only titanium peaks for both areas (*Fig. 3*).

The beam voltage was reduced to 5kV to detect materials at the surface. Spectra for the dark area, the light regions of the light mottled area, and the dark areas in the light mottled area show carbon, oxygen, and nitrogen. Titanium did not show up, owing to the low beam voltage.

The dark coated area had very high oxygen content, suggesting the coating was a paint containing oxide (probably  $TiO_2$ ) as an opaquing agent (*Fig. 4A*). The spectra for the light area within the light mottled area had the lowest signal-to-noise ratio, suggesting this was the "metal surface" (*Fig. 4B*). These results show titanium's strength as an oxide, carbide, and nitride former. The dark areas within the mottled area appear to be different than the coat surface, although both areas have high oxygen peaks (*Figs. 4A and 4C*). The oxygen to carbon ratio appears to be different for the two spectra.

Results for the 4½" Dome

*Fig. 5* shows microstructural features of the polished cross section of the 4½" dome. The two outer layers appear featureless while grain structure is apparent in the middle. The "color" of the cross section suggests all areas have a very similar atomic weight and are very likely to be the same material. Cracks appear to be contained only in the featureless outer layers.

The ESCA and surface examination results for the 4½" dome were very similar to the 1" dome. The surface showed a dark flaking area with a lighter-colored mottled area (*Fig. 6*). The base material was determined to be titanium for the cross section and surface using 10kV beam (*Fig. 7*). Using a 5kV beam revealed carbon, oxygen, and nitrogen (*Fig. 8*). The carbon peak was higher for the 4½" dome (light mottled area) compared to the 1" dome.

Summary

Both domes are titanium. No evidence of beryllium could be discerned based on EDXA, SEM, or BFI images.



FIGURE 2: SEM image of 1" cone surface showing flaking coating and material underneath.

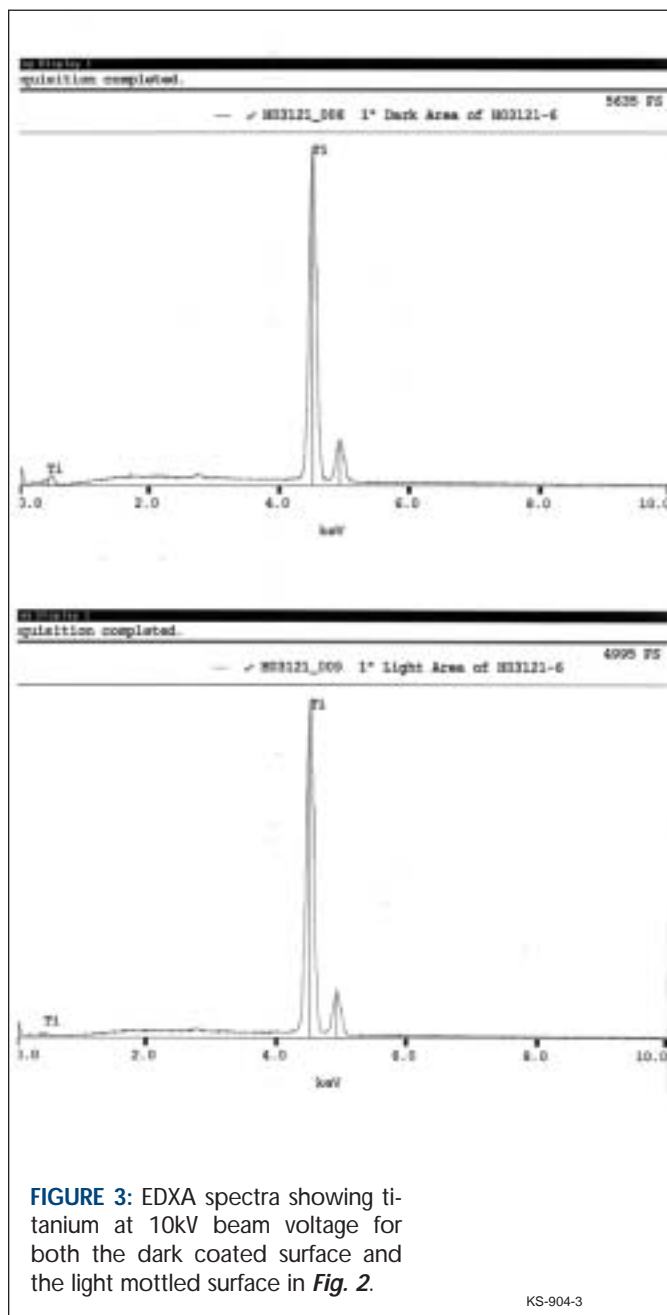
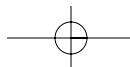
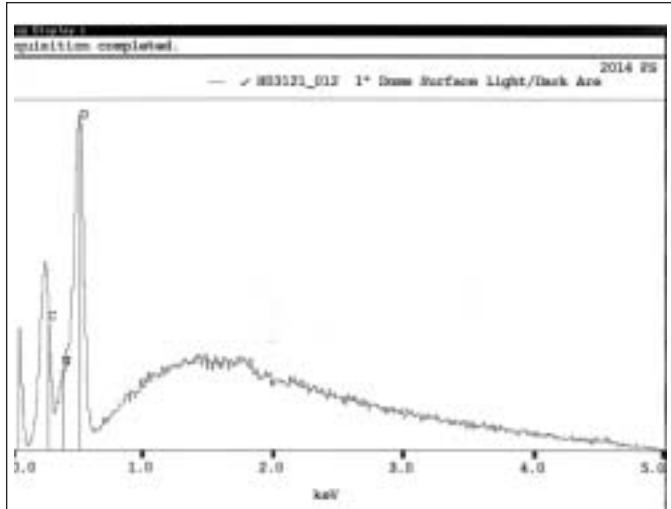
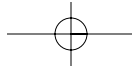


FIGURE 3: EDXA spectra showing titanium at 10kV beam voltage for both the dark coated surface and the light mottled surface in *Fig. 2*.

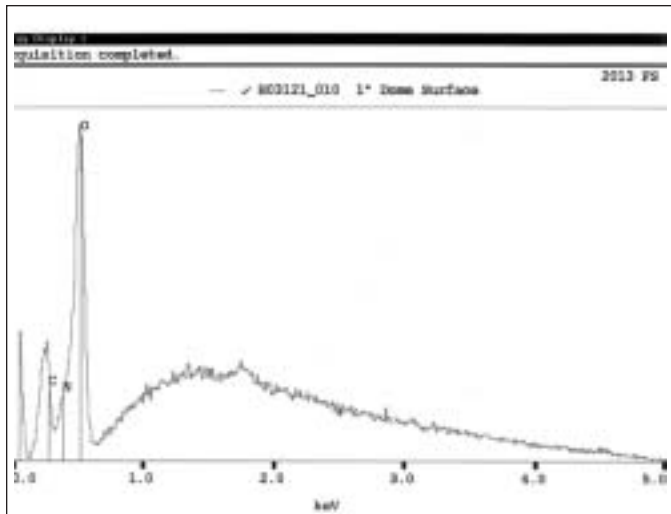
KS-904-3





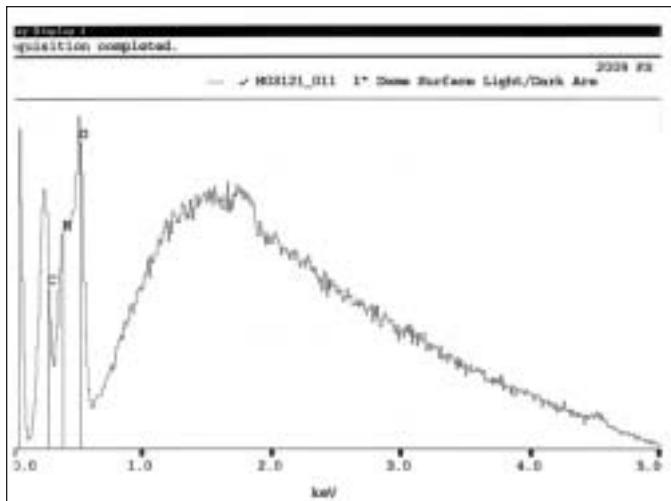
**FIGURE 4A:** EDXA spectra for dark area of the light mottled area in *Fig. 2*, showing high oxygen content.

KS-904-4A



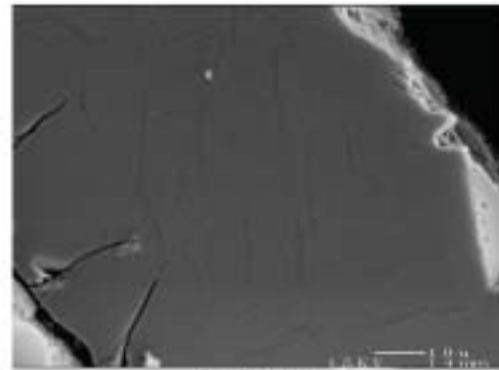
**FIGURE 4B:** Light area of the light mottled area in *Fig. 2*.

KS-904-4B

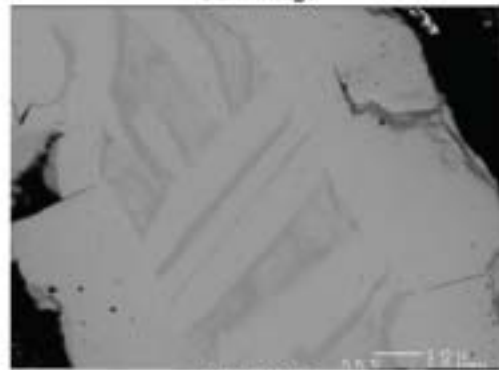


**FIGURE 4C:** Dark area of the light mottled area in *Fig. 2*.

KS-904-4C



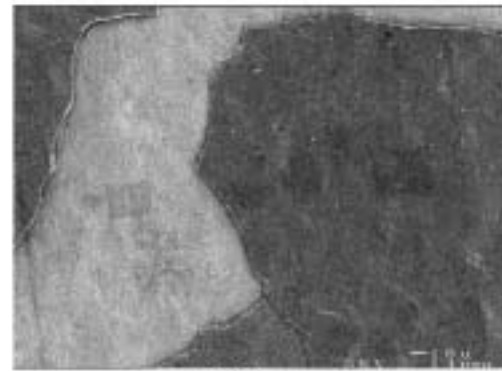
SEM Image



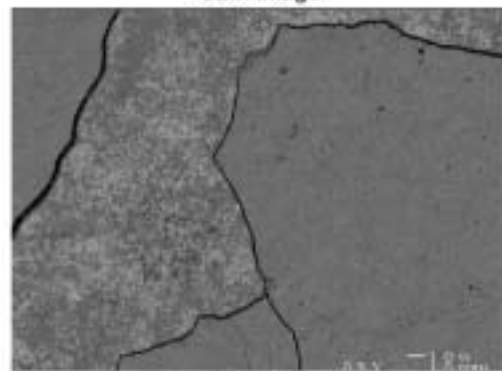
BEI Image

KS-904-5

**FIGURE 5:** 4 1/2" dome cross section images.



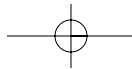
SEM Image



BEI Image

**FIGURE 6:** SEM and BEI images for 4 1/2" dome, showing similar features to 1" dome.

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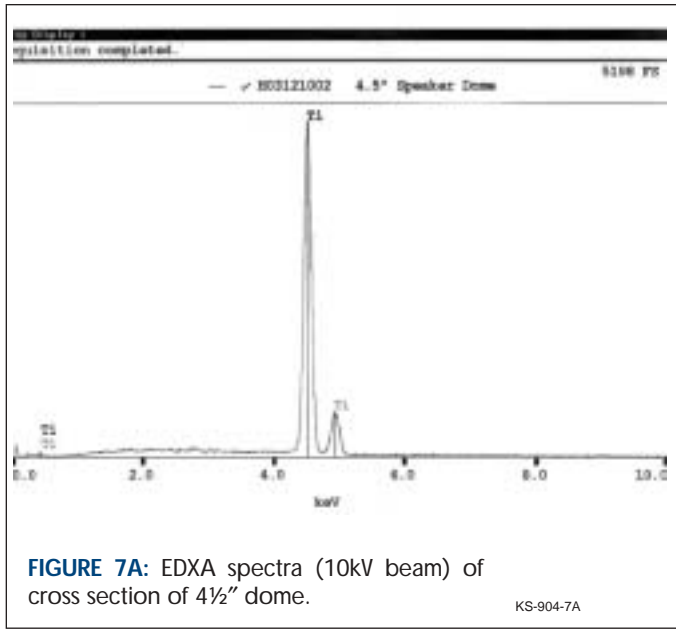
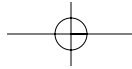


FIGURE 7A: EDXA spectra (10kV beam) of cross section of 4½" dome.

KS-904-7A

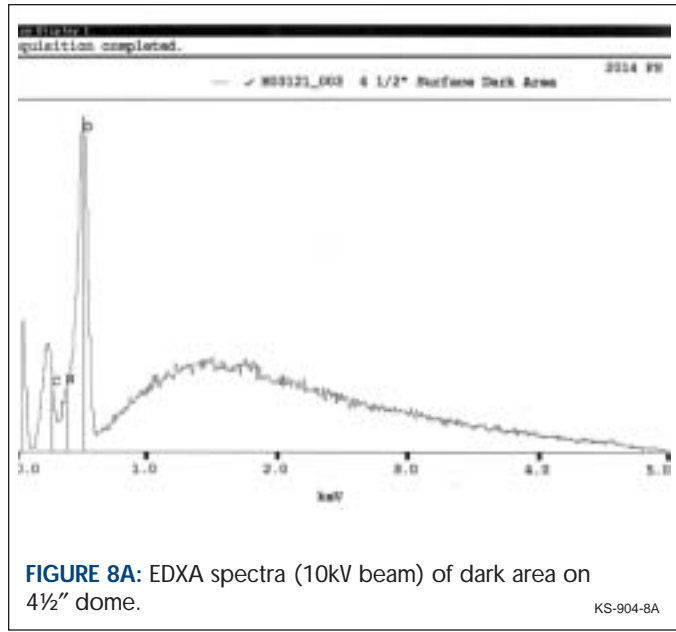


FIGURE 8A: EDXA spectra (10kV beam) of dark area on 4½" dome.

KS-904-8A

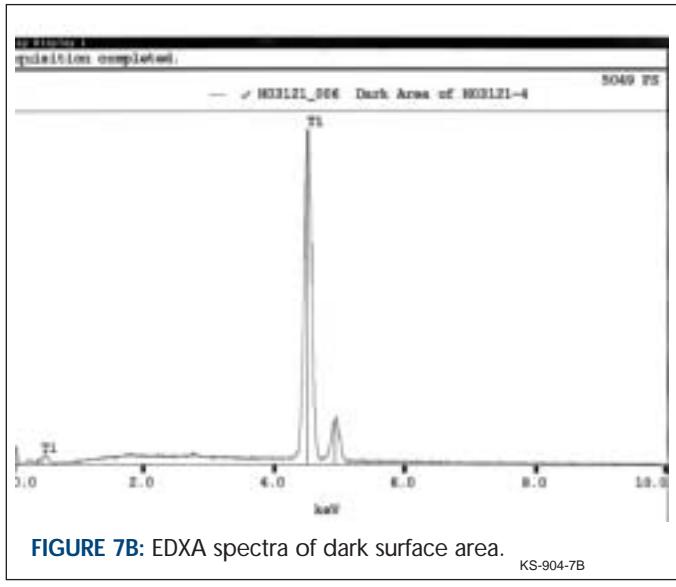


FIGURE 7B: EDXA spectra of dark surface area.

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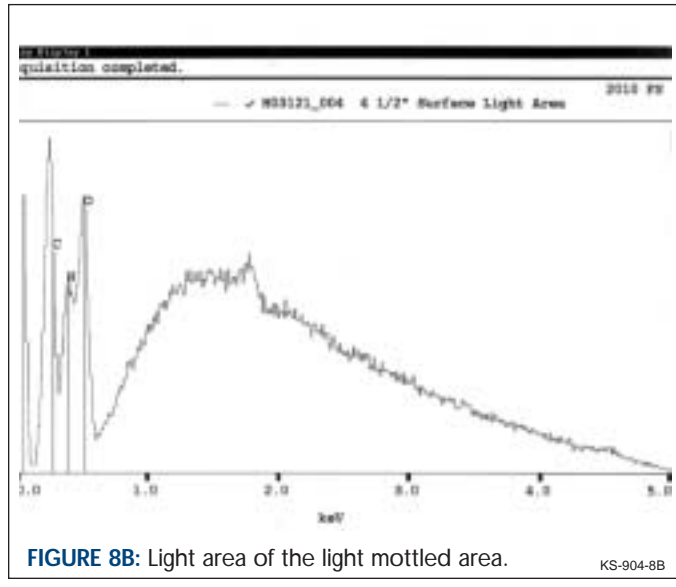


FIGURE 8B: Light area of the light mottled area.

KS-904-8B

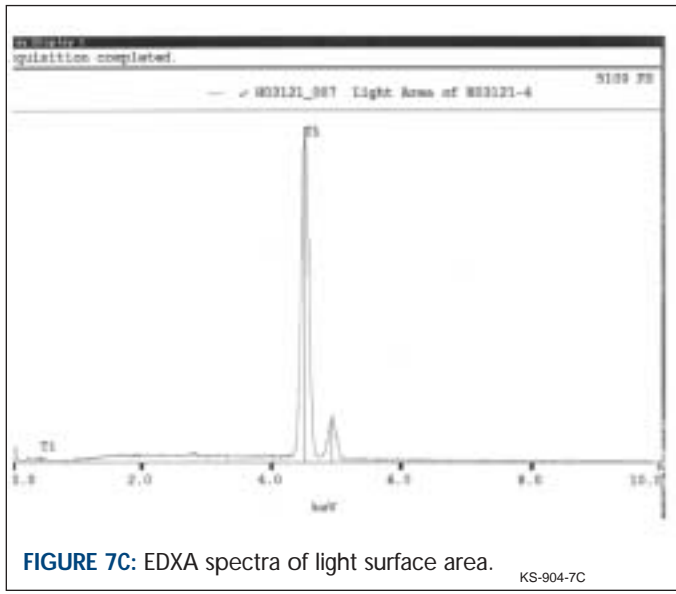


FIGURE 7C: EDXA spectra of light surface area.

KS-904-7C

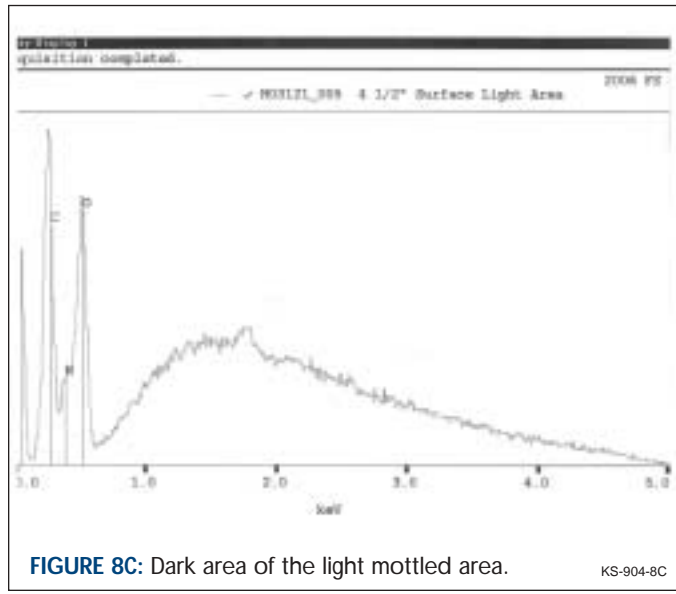


FIGURE 8C: Dark area of the light mottled area.

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