3D Contouring via White Light Interferometry

Optical profilometry is one of the top choices for surface topography measurements at the nano and micro scale for the microelectronics industry. The Wyko NT3300 Optical Profiler equipped at Ebatco's Nano Analytical and Testing Laboratory (NAT Lab) has a large vertical scanning range of 2mm. Contact or AFM profilers are sensitive to environmental factors, need significantly more time to properly map the topography, and risk damage to the micro or nanoscale surfaces. Optical profilometry can take significantly less time in imaging surfaces of samples. With other techniques, triangulation or line scanning is done as opposed to area based measurements. Optical profilometry is advantageous because it needs very little to no sample preparation, making measurements performed on the profilometer very fast and simple.

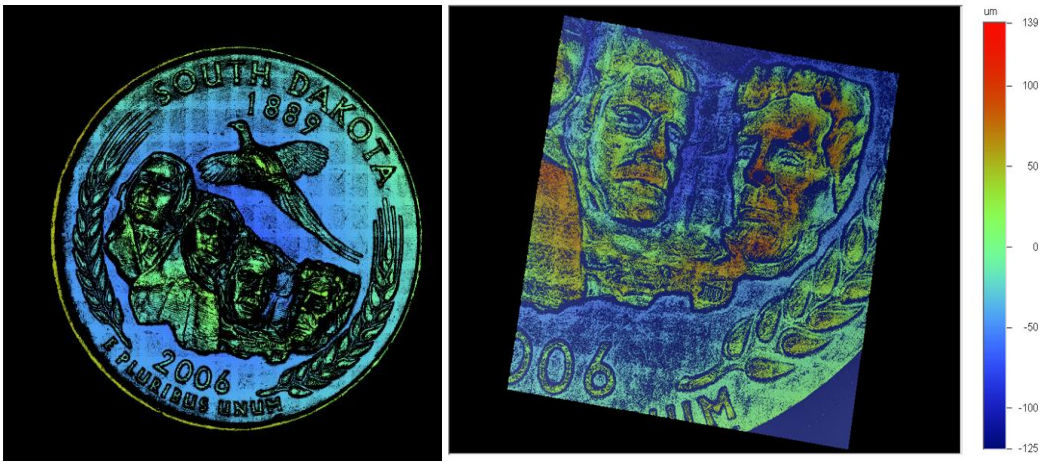

Figure 1. Optical profile (left) and 3D image of Lincoln and Roosevelt visages (right) on the South Dakota quarter specimen.

Presented here are contour images of a South Dakota quarter at different locations. In Figure 1, the image at left is a stitched image of many small scanned areas. The image at right is a 3D plot of the faces of Theodore Roosevelt and Abraham Lincoln. From the image, the plant is moderately raised while the nose and facial hair features on the presidents' faces are the most elevated features of that contour map. One of the highest features on the quarter typically is the edge of the ring, as shown in yellow from Figure 1. It can also be noted that the area surrounding the words South Dakota are slightly elevated, indicated by the green as opposed to blue for the rest of the base. From the higher magnification images in Figure 2, one can also see that the tail of the Ring-necked Pheasant is just slightly lower than the head of Theodore Roosevelt from the location

Address: 10025 Valley View Road, Ste 150, Eden Prairie, MN 55344, U.S.A.
Tel: +1 (952) 941-2199, Fax: +1 (952) 746-8086, Email: natlab@ebatco.com
www.ebatco.com

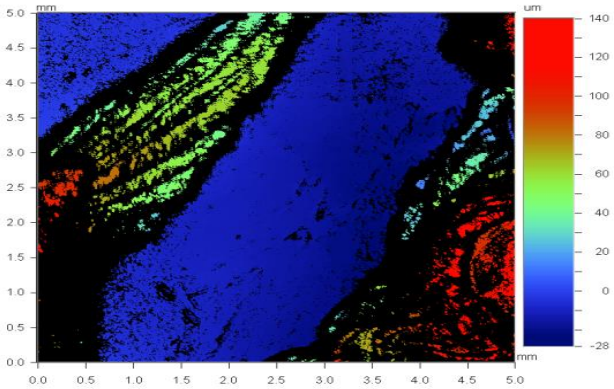

Figure 2. Close up interferometry image from above; the tail of the pheasant (left). Raised features display as red and orange, such as the wing regions, while the blue regions are lowest, such as the base of the quarter.

From Figure 3, it is clear that the center features are raised, while the areas on the right side are more elevated on the inner rings than outer rings. High resolution interferometry shows small details such as concentric rings lining the sides of the ring, with a missing area indicated by blue. Cracks permeating the rings can be seen in the image. The highest elevation is around the top area by the hole.

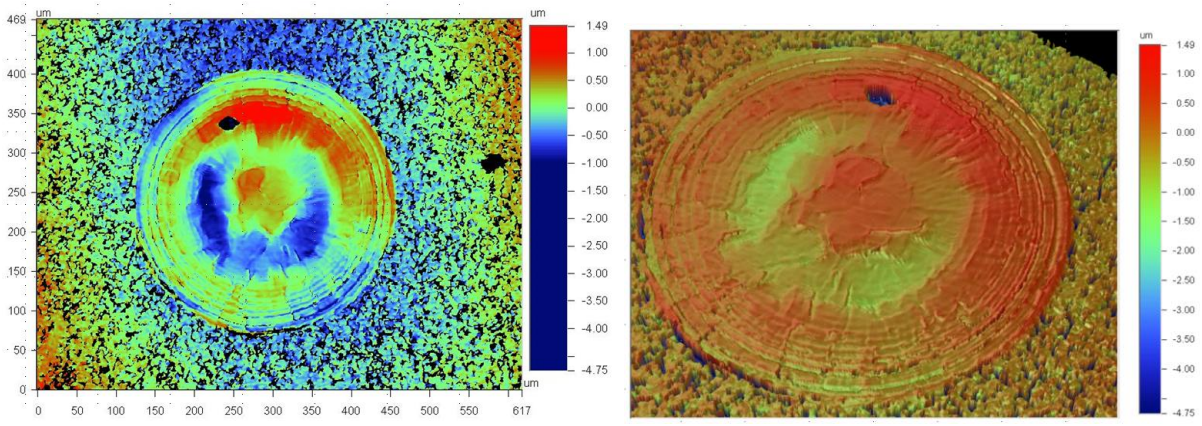

Figure 3. VSI optical profilometry of a hole on the surface of a hard disk head arm.

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