



Ebatco Nano

A Bimonthly Newsletter

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Nano Brief

To appreciate our loyal customers, supportive friends, and to welcome our new and prospective customers, we are planning our second Open House on June 24th. Like last time, we plan on having an afternoon filled with food, drinks, demos, discussions, and a raffle drawing at the end. Keep an eye on your mailbox for an invitation coming soon!

Also, we have added MS&T 15 and MD&M to the list for our upcoming tradeshow:

- April 20th – 24th, **Booth #306**, International Conference on Metallurgical Coatings and Thin Films, Town & Country Convention Center, San Diego, CA
- April 25th – 30th, **Booth #906**, SVC TechCon, Santa Clara Convention Center, Santa Clara, CA
- May 1st, MMS Spring Symposium, Minnesota Science Museum, St. Paul, MN
- October 5th – 7th, **Booth #629**, Materials Science & Technology 2015, Greater Columbus Convention Center, Columbus, OH
- November 4th – 5th, **Booth #1007**, MD&M, Minneapolis Convention Center, Minneapolis, MN

As always, please stop by and visit us if you are attending any of the above tradeshow. We would love to see you there!

Ebatco

As we continue to grow our business, we have hired on new talents to help with expanding our sales and marketing efforts, while also doing lab work when needed. Please welcome our two new additions to our technical team: Ms. Kim Carlson and Mr. Tom Mooney. Welcome onboard!

Ms. Kim Carlson is a graduate of Augsburg College with a major in chemistry and minors in math and physics. She has held analytical chemist positions in both the dairy and biofuels industries, and is excited to take on a more customer service-centered role at our company while still utilizing her broad science knowledge base.

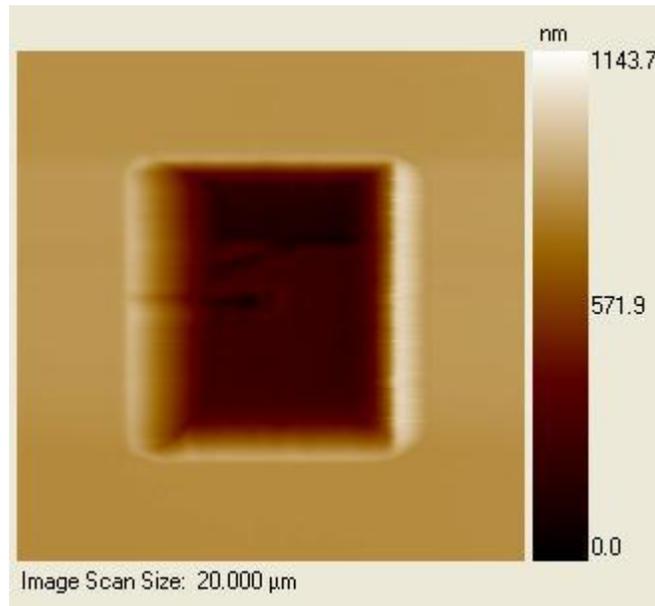
Mr. Tom Mooney has a physics degree from Minnesota State University in Moorhead Minnesota. During his time in college, he was a tutor and worked in a thin film deposition lab and a nuclear magnetic resonance lab. Since college, he has worked in several customer/client service positions, including over 3 years working in technical support. He has a passion for problem solving and understanding how things work. He is very excited to take on this new role as an Applications Associate at Ebatco!

Case Study

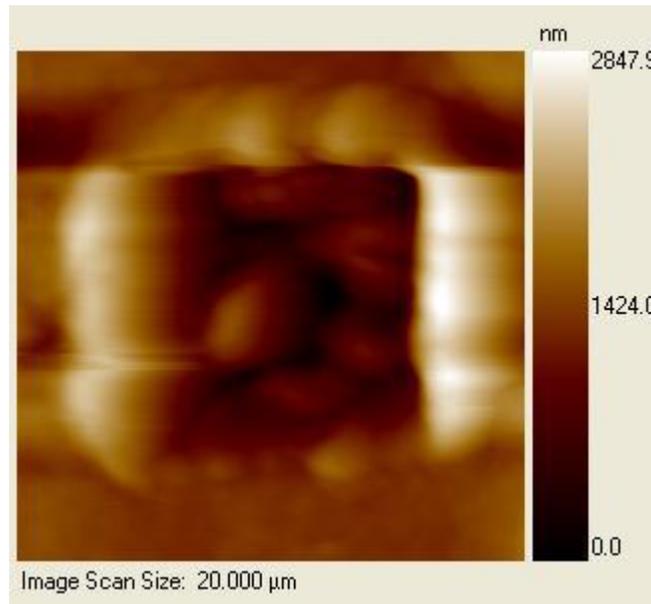
Nano scale wear that may be conducted on a nanoindenter with in-situ SPM imaging capability, such as the one equipped in Ebatco's Nano Analytical and Testing Laboratory (NAT Lab), is also called scanning wear. Scanning wear is a unique format of wear that removes material from the surface of its wear counterpart through raster scanning a probe under controlled load over a defined area. Scanning wear differs from other traditional wear formats such as reciprocating wear, fretting wear, fatigue wear, and corrosion wear by its distinct characteristics. Scanning wear involves a very small amount of material loss. It is typically done under a tiny load in the nano-Newton to milli-Newton range. The contact area can be at nanometer level, and the sliding distance may be limited to a few tens of microns or less. During a scanning wear test, a pre-selected load is applied to an indenter tip and the tip is raster scanned by the SPM scanner over a pre-selected sample area at a user-defined scan rate. After a certain number of scan passes over the area, a larger area will be imaged at a much lower load in order to capture the three dimensional topography of the wear crater. From the image, wear volume can be determined using image processing software.

Because scanning wear works with a very small volume of material, small structures can be tested that would otherwise be too small or too thin for conventional wear testing methods. Other applications of scanning wear include simulation of materials or devices that undergo light load or modest wear, wear study of ultra thin films, traditional wear mechanism investigation at nano-scale, simulation of single asperity scratch, plowing and fatigue wear, tribochemical research of wear surfaces under lubricated conditions, and wear debris generation study.

The scanning wear tests demonstrated here were carried out on a polymer thin film on Si substrate sample and a polyethylene implant cylinder that had been soaked in water. From the scanned images the wear volumes were calculated using imaging processing software. Knowing the number of passes, wear volume, scan size, and scan frequency, wear rates for any material can be determined.



Center wear crater and surrounding area used for wear analysis on a polymer film on Si substrate sample.



Center wear crater and surrounding area used for wear analysis on polyethylene specimen soaked in water.

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