



Thank you to everyone who visited with us at the Biointerface Workshop and Symposium and at MD&M Minneapolis! It was great to meet and talk with you about Ebatco and what we can do for you. We hope that through the interactions with Ebatco technical personnel you have learned more about how we could support your material and device testing needs. Please feel free to reach us at any time if you think we could be of your assistance.

Ebatco hosted a joint workshop, Viscosity and Beyond: Improve Product Quality with Modern Rheology, with Anton Paar USA on September 17, 2024. This workshop included presentations on the principles of rheology and their industrial applications, live demonstrations and small group sessions where attendees experienced hands-on sample testing.

Ebatco

As we continue to grow our business, we have hired on new talent to expand our expertise and testing lab service offerings. Please join us in welcoming the newest additions to the Ebatco team:

Dr. Jason Scheeler, Analytical Chemist

Dr. Jason Scheeler received his BS degree in Chemistry from Augsburg University and his Ph. D. in Chemistry from the University of Wisconsin-Madison. His undergraduate research focused on determining reaction rates for the decomposition of atmospherically relevant volatile organic compounds. His doctoral research used laser spectroscopy and microscopy to study semiconducting nanomaterials that have applications in solar cells and next-generation electronics. The main goal of this work was to understand the relaxation timescales and mechanisms of photoexcited charge carriers in the

nanomaterials. His research has resulted in 5 peer-reviewed scientific publications. Dr. Scheeler has spent his scientific career performing complex chemical measurements on a wide variety of samples, and as the Analytical Chemist at Ebatco, he looks forward to utilizing this experience to help support customer needs in any way he can.

Owen Keyes, Nano Analytical Lab Technician

Mr. Owen Keyes graduated from the University of Minnesota in spring of 2024 with a B.S. in Astrophysics. During his undergraduate education, he worked to create a model of Jupiter’s magnetic field and plasma disk in order to calculate Alfvén wave speeds throughout the Jovian magnetosphere. He also worked as a telescope operator at O’Brien Observatory, an infrared telescope near Marina on the Saint Croix that studies novae, stellar infrared emissions, and stellar dust clouds. He is excited to bring his knowledge of physics to the opposite side of the length scale, and focus on nano science as a lab technician at Ebatco.

Roger Fischer, Technical Sales Engineer

Mr. Roger Fischer received his BS in Mechanical Engineering from the South Dakota School of Mines and Technology and his MBA in International Finance from the University of Minnesota. He has spent over 25 years providing solutions for companies producing financial payment cards, identification cards and passports. Mr. Fischer hopes to draw on his international sales, consulting and technical management experience to help Ebatco expand its customer reach and grow its business.

Case

Study

Forensic Examination Using Atomic Force Microscopy

The field of forensics often focuses around matching unknown samples to known samples. This idea applies to matching blood samples, hair samples, residue extracts, and many others. The same concept is also used in identifying counterfeit money, performing forgery analysis, and discovering illegal trade items by comparing suspected counterfeit imports to genuine imports. As such, any instrument that can discriminate subtle differences in structure, composition, or behavior will be invaluable to all of these fields. In regards to the ability to discriminate among surface structural features, atomic force microscopy (AFM) is

one of the most powerful in elucidating such subtlety at the micro and nanoscale.

In its most straightforward form, AFM generates surface maps of a sample by rastering a small tip (typically nanometers in diameter) across a surface. As the tip moves across the surface of the sample, the tip will move up and down following fine surface contours while maintaining a constant contact force, and a detector is able to monitor the position of the tip as it traverses the peaks and valleys present on the surface of the sample. The Z height and X and Y position information are used to form a 3D structure map with nanometer resolution.

In this illustration of AFM, the surface structures of two hair samples were investigated: a cat hair and a human hair. The resulting images from the scans are shown in Figure 1. Differences in the two strands are immediately apparent. Human hair (Figure 1, left) grows in more linear sheets while cat hair grows with a more scale-like pattern. This difference is significant enough such that AFM can easily discriminate between hair samples from different species based on the different growth mechanisms present.

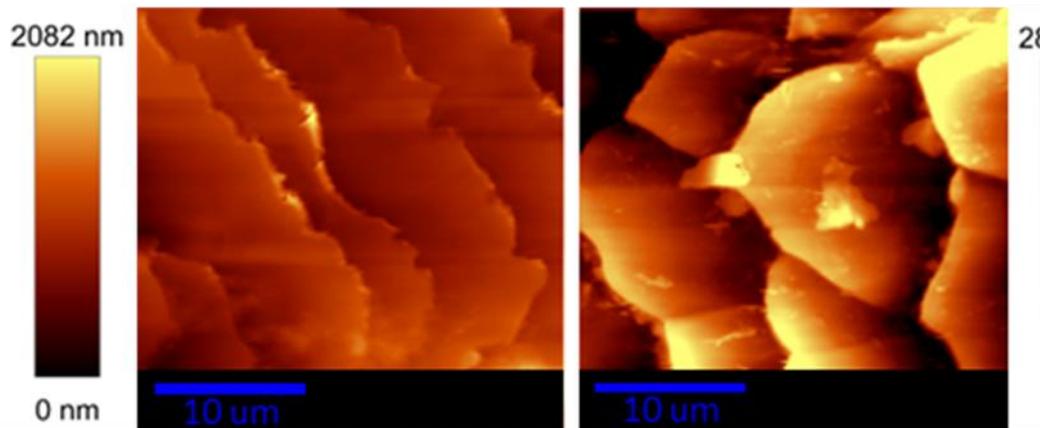


Figure 1. Topographical AFM images of two strands of hair: a human hair (left) (right). Hair strands were placed horizontally on the stage.

Furthermore, AFM is capable of generating extremely high-resolution images, allowing users to obtain some highly specific structural information from samples. Using the cat hair sample, the 3D topographical images (Figure 2, right) clearly show the molecular orientation of the large keratin fibers that constitute the cat hair. It can be seen that the fibers grow parallel to the direction of the hair growth. AFM is thus a very powerful tool to

obtain not only structural features, but also molecular information.

As known, AFM is capable of generating high resolution surface maps of almost any kind of sample, soft or hard. Additional non-contact or intermittent contact modes are often used for softer samples when direct contact mode is not well-suited to the sample. Because of the wide variety of imaging modes, AFM has numerous applications and the technique can be applied to a broad range of industries in addition to forensics.

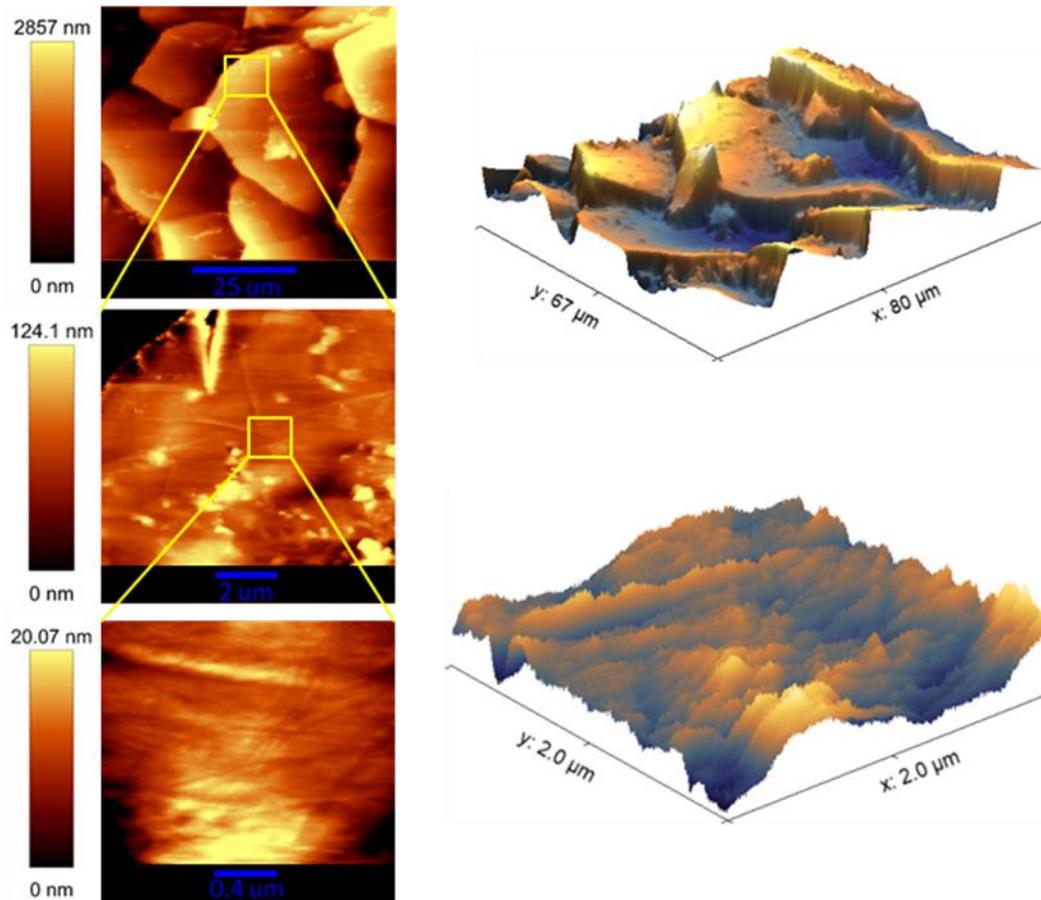


Figure 1. AFM images of cat hair obtained at three different zoom levels. 2D (left) and 3D topographical (right) images are shown. The

bottom images
even show the
arrangement of
the keratin fibers
used to grow the
hair.

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