

**Date:** 5/17/2021  
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**Client Name:** Lisa Finder / Enerpathic Technology

**Project scope:** Image two samples (before and after treatment) using AFM modes such as surface potential, phase and magnetic force microscopy.

**Experimental parameters:**

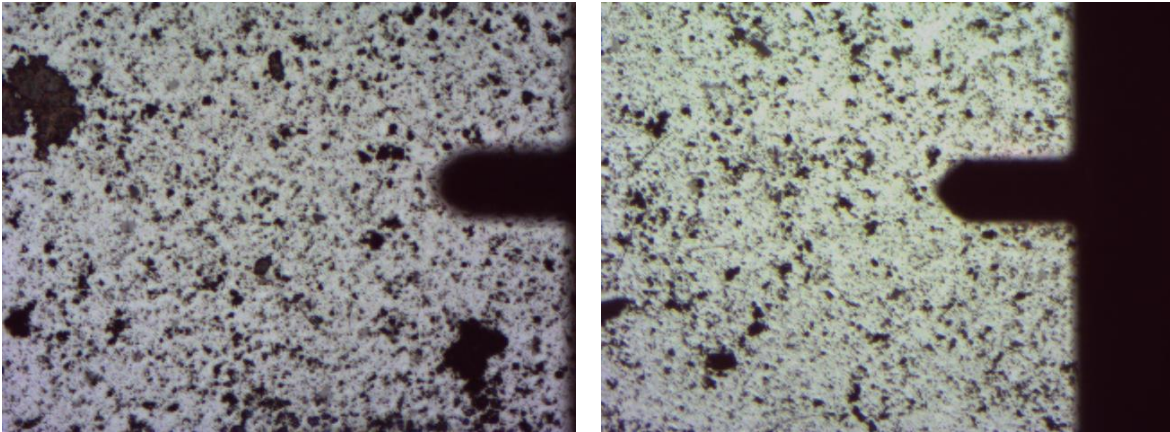
EQUIPMENT NAME	<b>Bruker Multimode-8</b>
<b>Probe Type</b>	NCHV-A, CONTV-Pt, MESP
<b>ROC, nominal</b>	8 nm, 25 nm, 35 nm
<b>Scan Rate, nominal</b>	1.00 Hz
<b>Scan Size</b>	10 $\mu\text{m}$
<b>Samples/Line</b>	512, 256, 512

**Sample mounting description:** Samples attached to a stainless-steel disc using conductive silver paste.

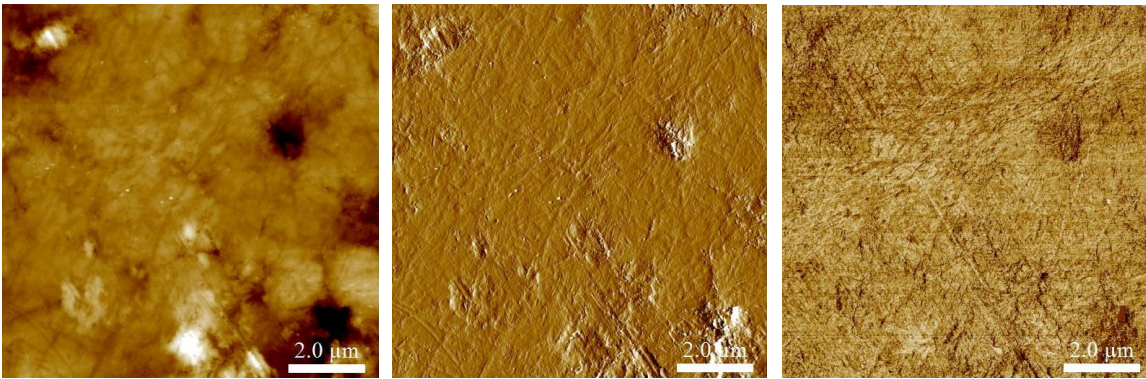
**Experimental Results:** Images were scanned using the NCHV-A probe in tapping mode in order to provide height, amplitude, and phase contrast images for both the Control and the 1-Blu sample.

A CONTV-PT probe was used for the Surface Potential imaging. It's a silicon probe coated with conductive PtIr on the tip side. There was no change in the surface potential observed throughout the 10  $\mu\text{m}$  x 10  $\mu\text{m}$  scanned area for the Control. The potential remained at 0 V using a 50 nm lift height and a 0.3 V offset with a gold reference. However, for the 1-Blu sample there was ~140 mV potential observed using the same 50nm lift height and the -0.3 V offset.

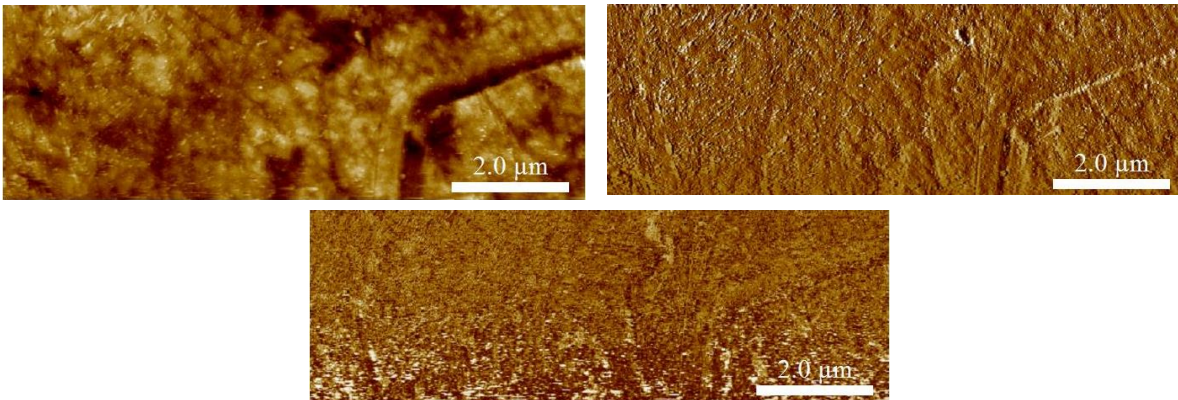
The MESP probe was used for the Magnetic Force Imaging. It is a silicon probe with a magnetic CoCr coating on the tip side. Magnetic domains can be observed on the Control sample at a pitch of approximately 1.7  $\mu\text{m}$ . There were no magnetic domains observed on the same size image for the 1-Blu sample. Images can be reviewed in the following pages.



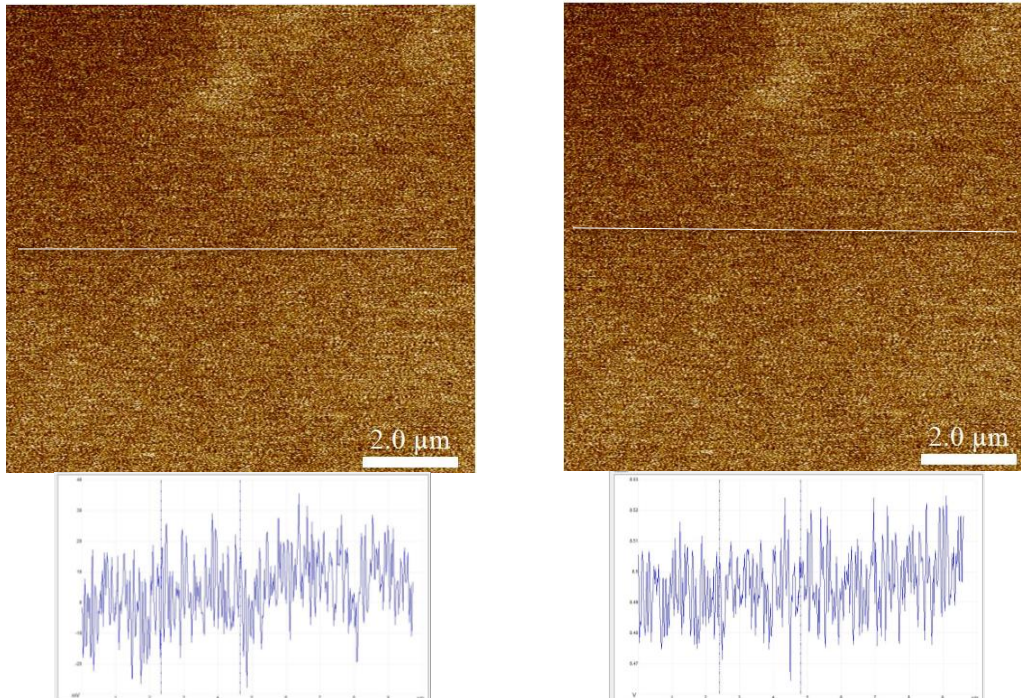
**Figure 1.** Optical images of Control Enerpathic (left side) and 1-Blue (right side) before probe is engaged on the surface. Probe is black object located on the right.



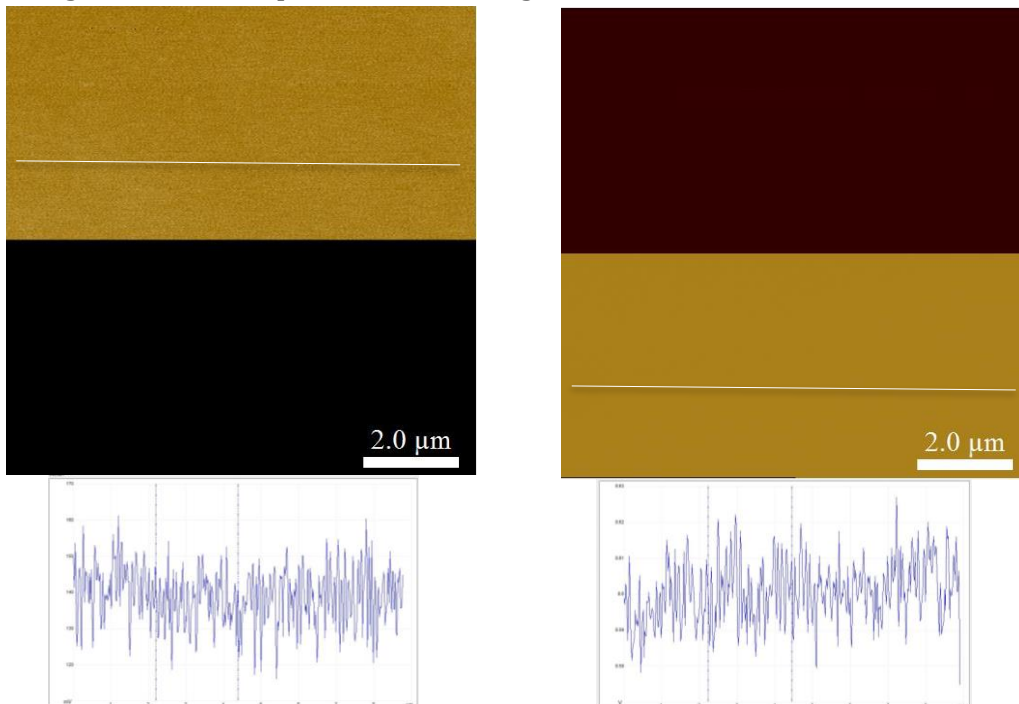
**Figure 2.** Height (left), amplitude (center) and phase (right) images of Control Enerpathic sample.



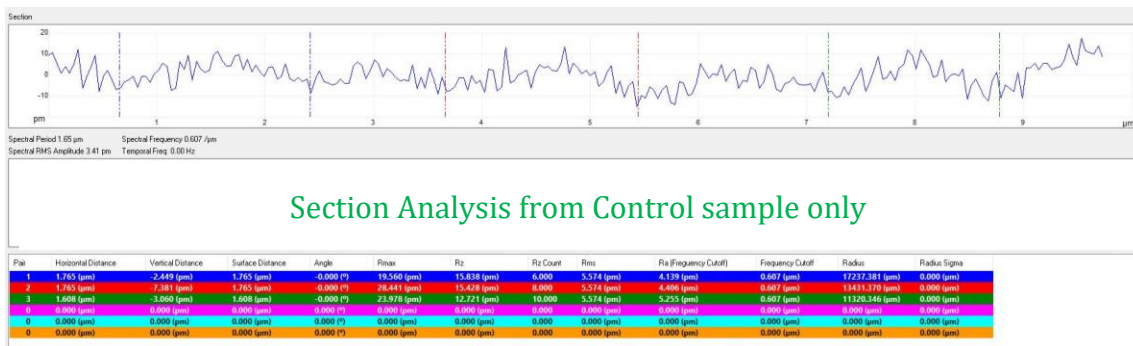
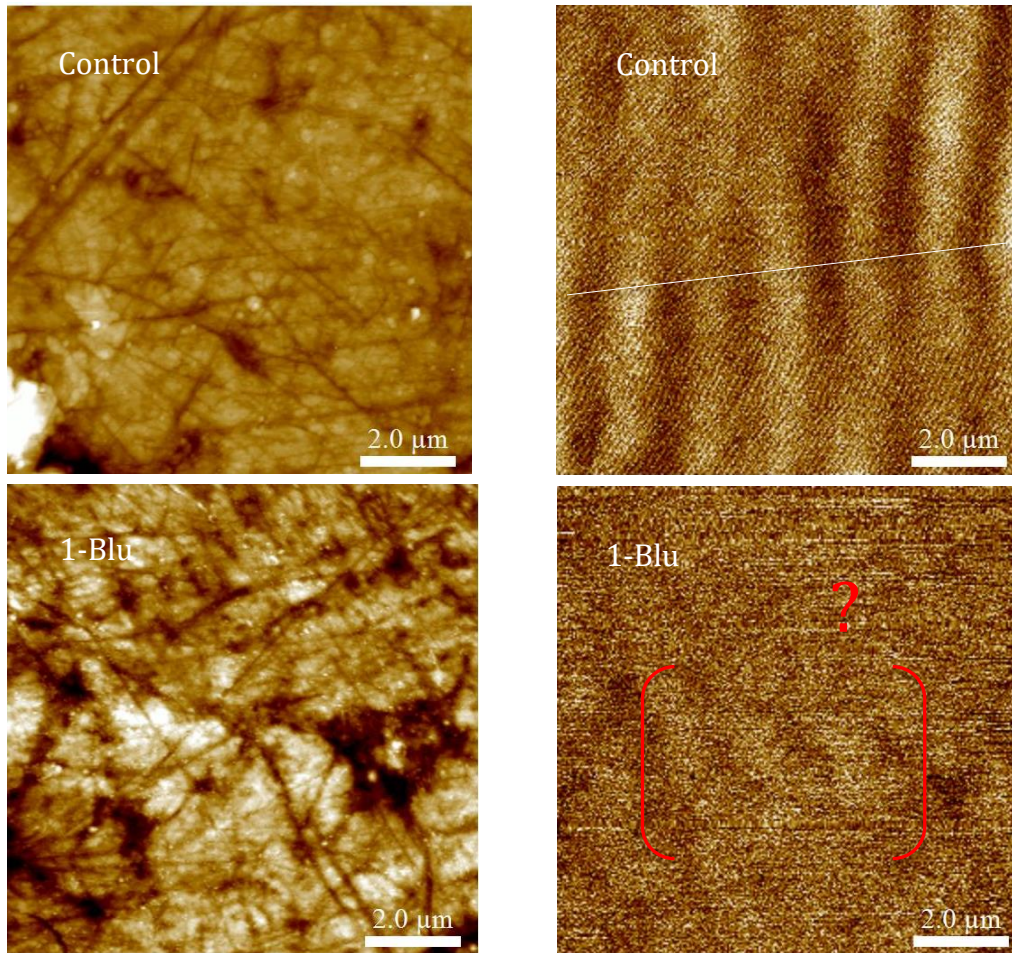
**Figure 3.** 3:1 aspect ratio Height (left), amplitude (center) and phase (right) images of 1-Blue, treated sample. Unable to keep probe in contact with the surface for full 1:1 image.



**Figure 4.** Surface Potential images of Control Enerpathic sample. Left image scanned at 0 V, right image scanned using 8 V applied sample bias. The white line on each image is where the potential vs. voltage was measured.



**Figure 5.** 2:1 Surface Potential images of 1-Blu sample. Left image scanned at 0 V, right image scanned using 8 V applied sample bias. The white line on each image is where the potential vs. voltage was measured. The treated sample indicates a potential of  $\sim 140$  mV.



**Figure 6.** Magnetic Force Imaging of Control Enerpathic sample. Top left is height image, top right is amplitude image showing periodicity of the magnetic field. The white line is the location of the section profile shown below the images. The periodicity of the magnetic fields is approximately 1.61 µm – 1.76 µm as indicated by three pairs of markers (see table color coded to markers in graph). Bottom left and right images are from 1-Blu, treated sample; height and amplitude images respectively. Magnetic domains are inconclusive and faint at best in sample 1-Blu.