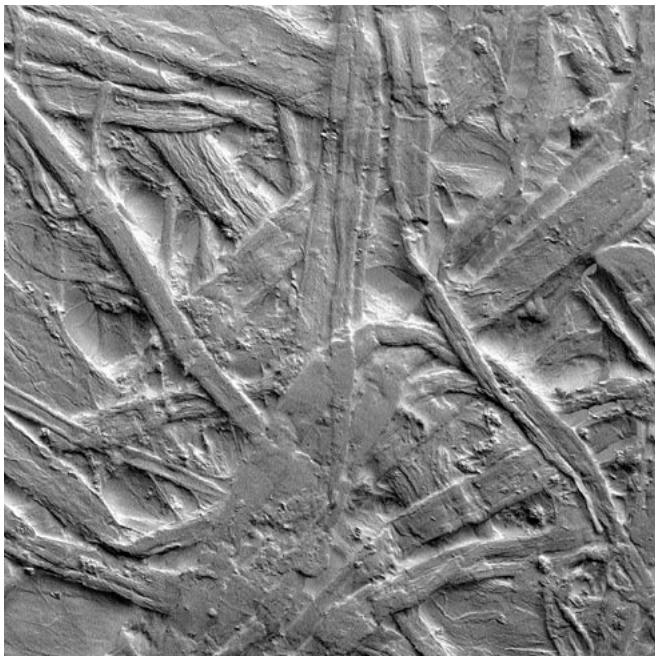
Phenom™ Paper Applications

The process of turning raw cellulose fibers into finished paper products requires sophisticated lab tools to evaluate paper composition, bonding properties, coatings thicknesses and surface uniformity throughout the development and manufacturing process. For all of these applications, a picture is worth a thousand words, and is a critical element of understanding the actual behavior and interactions of the multiple materials involved.

Image of regular printer paper showing individual fibers. Magnification 830x, field of view 240 µm.



Same image showing 3D effect of the fibers by using special detector techniques.

Light microscopes have been the traditional instrument of choice for obtaining these images, but as paper products have become more complex, the resolution needed to properly observe and measure these key features has shrunk beyond the range of standard light microscopy. Further, light microscopes lack the ability to distinguish topological structures.

The Phenom™ provides the extra magnification levels necessary to see paper fibers, fillers and coatings, and the depth-of-focus to clearly observe 3D surface phenomena. These capabilities can be used during the R&D process as well as for failure analysis and ongoing quality control.

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APPLICATION NOTE

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Analyzing Paper Composition

One of the core trends within the paper industry is to create lower cost products by using less materials and less-expensive materials. This can be accomplished by creating papers with stronger fiber structures using improved chemical additives and pigments. The Phenom supports these efforts by allowing the user to see the resulting fiber structures and distribution, and to observe the fiber/fiber bonding and fiber/filler bonding in the paper.

Another common need is to identify specific fiber and filler elements (e.g. what type of tree was this made from?), used in reverse-engineering as well as simply confirming the manufacturer of a particular paper. Again, the added magnification and depth-of-focus of the Phenom enable these component identifications to be made quickly and accurately.

Measuring Paper Coatings and Adhesives

For papers with multiple layers, coatings and adhesives, there is an ongoing need to assess the coating thicknesses and bonding between the layers. Cross-section views of the paper provide a quick way to observe the material interactions at the boundaries and to make quick measurements of coating thicknesses.

Of equal importance is the uniformity of the coating across the paper surface and the potential for pin-holes or extra material deposits. This has become more important as coating thicknesses continue to get thinner and thinner.

Using the Phenom's topographic mode enables the user to quickly scan the surface of the paper sample and judge overall smoothness and identify pin-holes or faulty depositions.

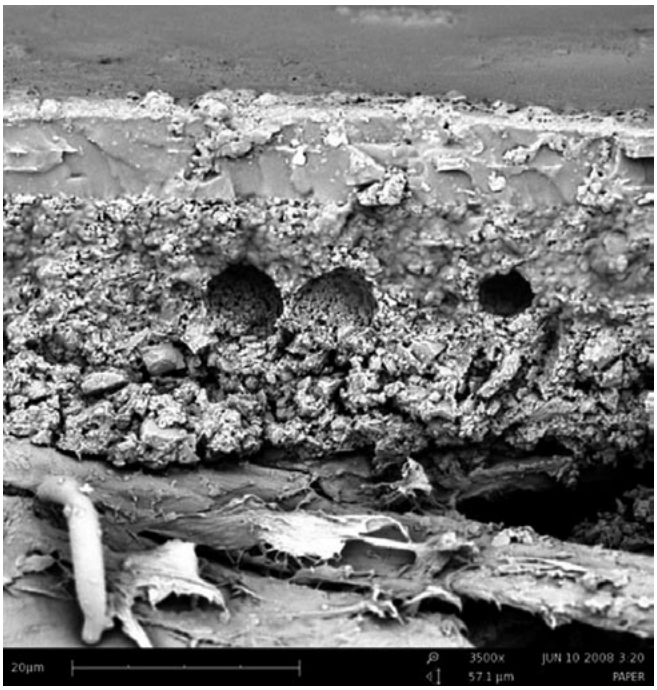

Image showing three distinct layers on coated paper. The bottom layer is the paper substrate, the middle layer (21.0 µm) a spray coating, and the top layer a final gloss finish (9.39 µm). The large holes in the center are indicative of a faulty deposition in the coating process.

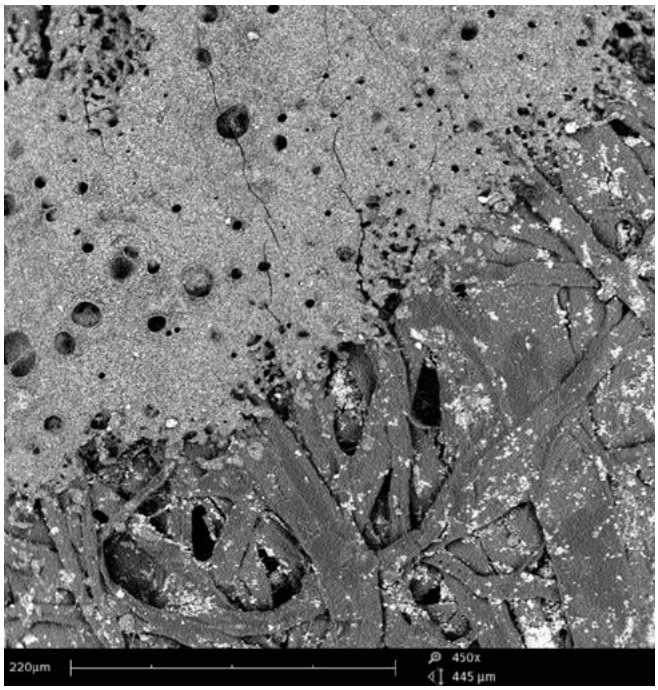

Image showing ink (laser printer) on top of normal paper.

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Phenom-World BV
Dillenburgstraat 9E
5652 AM Eindhoven
The Netherlands

Find your Phenom-World contact information at
www.phenom-world.com

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