Ebatco Nano
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Nano Brief

Ebatco will still cautiously plan to attend upcoming events, one of which will be ISTFA 2021 which will take place in Phoenix, AZ at the Phoenix Convention Center from Oct. 31st – Nov. 4th. Please visit us at booth 616!

Ebatco

1). As we continue to grow our business, we have hired on new talents to expand our marketing programs and testing lab services. Please join us to welcome the new addition to our technical team: Mr. Philip Eldridge.

Mr. Philip Eldridge graduated in Fall 2020 from Bethel University with a major in Chemistry. His undergraduate research focused on producing carbon thin-films on various materials through thermal chemical vapor deposition, as well as analyzing the properties of these films. Prior to joining Ebatco Philip has also worked at 3M for two years on a variety of polymeric materials. He is excited about the opportunities to apply his chemistry knowledge and research and instrumentation experience to the contract lab services that Ebatco offers.

2). To ensure uninterrupted lab services and guaranteed turnarounds for the increasing demand on macroscratch testing, Ebatco has acquired the second CSM (now Anton-Paar) Revetest Macro Scratch Tester. The instrument is capable of making high load (up to 200N) scratches for scratch resistance and coating interfacial adhesion strength evaluation, single-pass and reciprocating friction and wear testing. The instrument is equipped with the panoramic imaging functionality for imaging long scratches at high magnifications. The instrument is very well known for testing hard and relatively-thick film coating materials, such as the ones used in cutting tools and automotive paints. Please feel free to request more information about it or send in your samples to give it a try!

Ebatco newly acquired CSM (now Anton-Paar) Revetest Macro Scratch Tester.

3). For the month of August, we are celebrating two birthdays at Ebatco! Jon Yang and Eric Smolensky both got their birthdays celebrated with cakes and Ebatco colleagues' blessings! Happy Birthday to Jon and Eric!

Eric Smolensky at his birth day celebration.

Case Study

Scratch Failure Test of Automotive Paint Coatings

Paint coatings are widely used for prolonging product lifetimes and enhancing functionalities of automotive parts and components. For example, paint coatings not only add aesthetic beauty to a car, but also help it to withstand a variety of environmental and road hazards. Automotive paint coatings are typically composed of several layers: a primer layer that promotes adhesion of the paint coatings to the metal body underneath, a base coat that contains pigments and colorants, and a clear coat that protects the underlying layers. These paint coatings are designed to last for the lifetime of a car and to maintain an attractive appearance. Therefore, evaluating a coating's resistance to mechanical damage and its adhesion to the car body become critical issues in designing successful coating systems. Fortunately, scratch testing has been developed and adopted as a standard method to tackle these issues.

In this demonstration, the interfacial adhesion and scratch resistance of an automotive coating system was assessed through scratch testing that was carried out on a Revetest Macro Scratch Tester (manufactured by Anton Paar). During the scratch test, a sharp conical probe made of diamond was dragged across the sample surface while a linearly increasing force perpendicular to the coating surface was applied. As the force increased, various types of failures were created in the coating system. These failures could take the form of scratches, cracks, and delamination. Scratches and cracks are cohesive failures within the coating, while delamination represents failure of the interfacial adhesion between layers. By determining the types of failure and the critical loads at which they occurred, it was possible to quantify the coating's ability to resist mechanical damage.

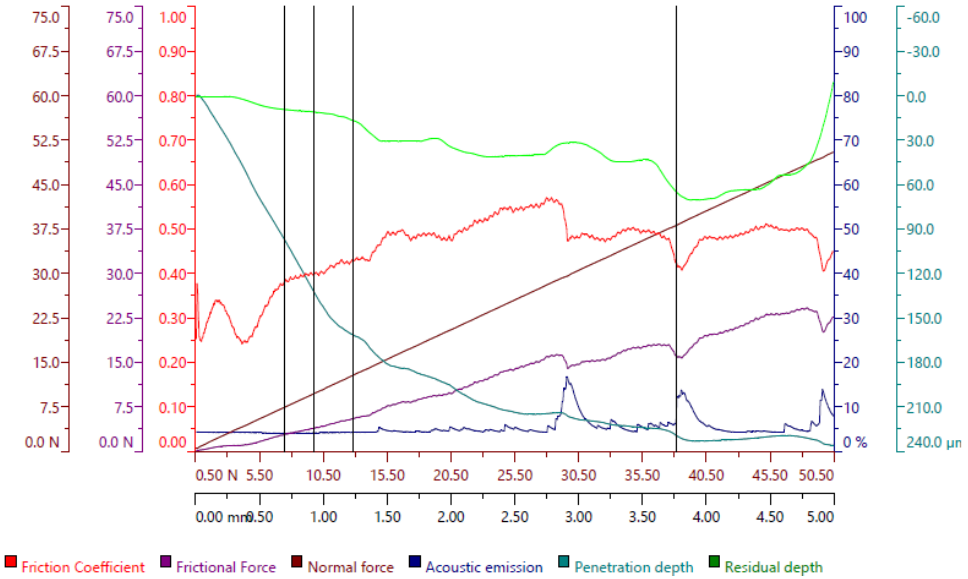
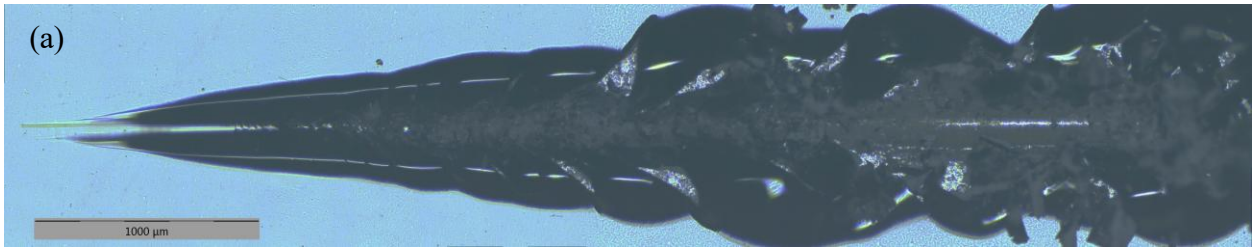


Figure 1. Scratch parameter curves of the automotive paint system during a scratch test. The black vertical lines indicate critical loads of failure for different failure modes.

Figure 1 shows the scratch test results obtained for this automotive paint coating specimen. From Figure 1, it can be seen that there are four critical loads identified based on the analysis of the scratch curves and optical observation of the scratch surface. Figure 2 (a) presents a panoramic image of the corresponding scratch track. The first critical load, 7.51 N, was the force at which cracks started forming in the clear coat, as seen in Figure 2 (b). The second critical load, 9.75 N, was the force at which cracking became more severe, as seen in Figure 2 (c). The third critical load, 12.86 N, was the force at which the clear coat delaminated from the pigment layer, as seen in Figure 2 (d). The fourth critical load, 38.11 N, was the force at which the entire coating system separated from the metal substrate, as seen in Figure 2 (e).



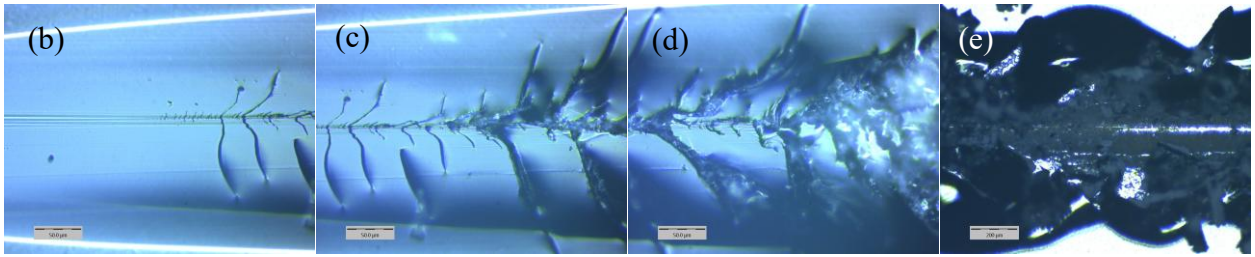


Figure 2. A 5 mm long scratch on automotive paint. A 5x objective lens was used to create a panoramic image of (a) the entire scratch track. A 20x objective was used to image (b) the onset of cohesive cracking in the clear coat layer, (c) the severe cracking of the clear coat layer, (d) the delamination of the clear coat layer from the pigment layer, and (e) the complete coating delamination resulting in exposed substrate.

This automotive paint coating scratch failure study clearly demonstrates that scratch testing is a powerful technique for characterizing coating/substrate systems. Furthermore, scratch testing has the capability to determine the interfacial adhesion strength of the coating system, as well as to predict its resistance to scratches that will be encountered during in-field service.

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