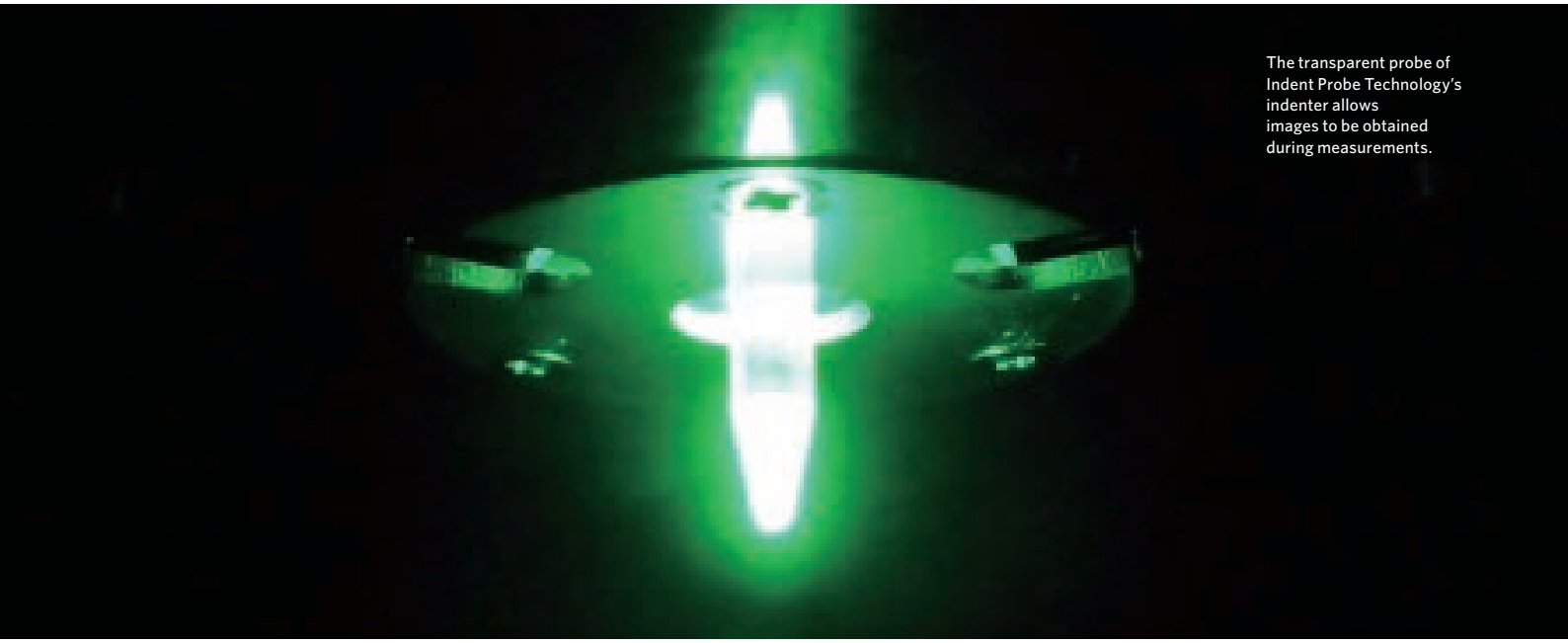

The transparent probe of Indent Probe Technology's indenter allows images to be obtained during measurements.

PUSHING THROUGH THE BLIND SPOTS OF MICROMECHANICAL TESTING

A new microscope provides quick, quantitative materials characterization using A TRANSPARENT PROBE INDENTATION SYSTEM.

Ever since the 1900 Paris Exposition, where Swedish metallurgist Johan Brinell demonstrated that the hardness of steel could be determined by pressing a tiny ball into it, researchers have been using indentation testing to analyse the mechanical properties of materials. Now, an instrument developed at Indent Probe Technology in Japan is set to update this technique for the 21st century by making it possible to observe contact mechanics with real-time imaging.

The procedure has changed little since Brinell's time. A hard, sharp probe is pushed into a sample surface until it begins to displace some material. The resulting force–displacement data can give detailed insights into aspects such as mechanical stability and crack formation. But this analysis is based on theoretical contact models that may not apply to real situations.

"Most conventional indenters don't account for deformation arising from the pile-up around the periphery of the contact area in some elastic–plastic materials," explains Yoshiyuki Nakura, president of Indent Probe Technology. "But when a triangular probe pushes into a material, the contact area adopts a slightly different shape because of some irreversible plastic deformation. It's hard to measure accurately because conventional indenters cannot see what's happening on the surface."

To circumvent the time and cost of data correction associated with conventional indenters, Nakura and his colleagues explored a more direct approach. Using transparent probes made of artificial diamond or sapphire, the team developed the ability to pass light beams through the indenter as it ploughs into a surface, relaying images back and forth to an optical microscope. Users can view the contact processes as they happen via a patented software system that processes the data.

IT HAS THE POTENTIAL TO MAKE A REAL IMPACT

"The base unit system is a desktop-size device that can generate 16 types of mechanical data in a single operation," says Nakura. "Our customers find it easy to be trained on and produce quantitative results right away."

Since launching in 2017, Indent Probe Technology Inc. has mainly been helping clients working with microelectronics and specialty metals, such as the components needed to fabricate electric vehicles and high-temperature solder alloy. But recent collaborations with academic partners have revealed the potential of this instrument for soft substances such as polymers, hydrogels and biocompatible materials.

"Soft materials are very sensitive to being pushed, and we get a kind of ripple effect when our probes make contact" adds Nakura. "Capturing these features in real-time can reveal some complex data, such as the adhesive surface energy it takes to cell division. It has the potential to make a real impact in material development." ■

INDENT-PROBE TECHNOLOGY

For more technical information:
www.indentpt.com/download_en/