

## Unique sensor film minimizes defects and improves quality in Wafer Bonding

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*Pressurex surface pressure indicating film from Sensor Products Inc. is a quick, accurate and economical way to detect and correct pressure variations which can result in flaws (defects) in the wafer bonding process. When placed between contacting surfaces, it instantaneously and permanently changes color directly proportional to the actual pressure applied. With Pressurex, variations in pressure that lead to imperfections (or irregularities) in the bonding process can be accurately detected and corrected -- improving yield, decreasing scrap, and boosting productivity. Pressurex can be used in virtually any application where two surfaces contact each other. Applications include materials testing, composite lay up, fuel cell stacks, heat sinks, pcb lamination, clamping, bolted joints, heat sealing, converting, die extrusion, injection molding and countless others.*

In wafer bonding, two flat substrates are permanently joined together by applying carefully calculated pressure, temperature, and voltage. Of the three parameters, pressure is often the most difficult to precisely ascertain and control.

Traditional methods assume perfectly flat pressure plates.

However, in nearly all real environments pressure plates are not ideal due to manufacturing or installation variability and degradation over time from wear. The result is difficult to detect pressure variations across the surface that can lead to un-bonded wafer areas, cracked wafers, and premature wear of the pressure plates.

Pressurex systematically measures pressure across the entire pressure plate. It is a mylar based film that contains a layer of tiny microcapsules. The application of force upon the film causes the microcapsules to rupture, producing an instantaneous and permanent high resolution "topographical" image of pressure variation across the contact area.

When placed between contacting surfaces of the wafer bonding fixture, the film instantaneously and permanently changes color directly proportional to the actual pressure applied. Precise pressure magnitude is easily determined by comparing color variation results to a color correlation chart (conceptually similar to interpreting Litmus paper). The film's thickness is 4 or 8 mils, which enables it to conform to tight spaces. It is ideal for invasive intolerant environments not accessible to conventional electronic transducers. Additional pressure analysis of the film is available through Sensor Product's Topaq Imaging System which assimilates the pressure distribution into 2-D and 3-D pseudo color images, histograms and line scans among other features.

Kwan-yu Lai, Research & Development Engineer at Micralyne Inc, one of the largest independent MEMS foundries in the world, uses Pressurex to adjust the compression exerted by their bonding tools. Early testing of their bonding results analyzed with the film reveals a donut shaped high pressure ring with relatively little pressure applied to the center ((left)). The line scan further elaborates these pressure inconsistencies (center). After a series of adjustments the final result is a more uniform distribution of pressure (right).

Wafer-to-wafer bonding has become an enabling semiconductor technology in industries such as 3D packaging, MEMS, MOEMS, and SOI. Pressurex is being used across a wide range of bonding technologies, including metal eutectic, anodic, fusion, metal diffusion, glass frit, and polymer adhesive bonding

The "snapshot" imaging results of Pressurex can be used as a control to compare processes and tools, making it ideal for six-sigma and other closely monitored high performance manufacturing operations. Pressurex measures pressures from 2 - 43,200 PSI (0.14 - 3,000 kg/cm<sup>2</sup>).

For a free sample in your desired range, visit [www.sensorprod.com/sample](http://www.sensorprod.com/sample)