In-vitro diagnostic (IVD) and microfluidic devices are routinely utilized to detect various analytes including nutrients, hormones, various biomarkers, drugs-of-abuse and environmental contaminants. Manufacturers of IVD devices strive for three important goals:

1) Reduce the amount of fluid required
2) Reduce the time needed for the test
3) Improve the accuracy of the device

PSA: A Critical Component in IVDs
Device manufacturers often utilize pressure-sensitive adhesives (PSAs) in the assembly of IVD and microfluidic devices due to the material’s ease-of-use and manufacturing efficiencies related to the continuous roll format. Many diagnostic test applications feature a substrate material which is laminated to a spacer tape that is cut to form channels. The channels are then laminated with a top sheet substrate to form rectangular capillaries that are an essential functional component of the device. Hydrophilic coatings or adhesives are often applied to the top sheet stock to improve device performance and are available in the form of films, PSAs and heat-seals to provide IVD manufacturers with a variety of configuration options in the assembly of hydrophilic channels.

The Importance of Capillary Flow
The microfluidic channels found in IVDs allow for the transport of a biological fluid through mechanical means or by capillary flow action from the sample inlet port to the detection zone of the device. For capillary action to occur, it is essential that the walls of the microfluidic channels reliably demonstrate hydrophilic characteristics, including spontaneously filling in a rapid and consistent manner, without interruption. Adhesives Research (AR) is addressing the industry’s needs for faster, more accurate test results with enabling hydrophilic adhesive technologies that not only bond components, but also improve test performance.

Second Generation Hydrophilic Technology
IVD and microfluidic tests rely on several techniques for achieving the desired fluid movement for accurate test results. In some devices, fluid flow is controlled through mechanical pumping, while others depend solely on capillary flow. In the latter example, hydrophilic channels created with hydrophilic adhesives and coatings manage the capillary flow.

Earlier generations of hydrophilic adhesive technologies relied on the blooming of a surface active agent, which could ultimately reduce the consistency of the hydrophilic properties while also decreasing the bond strength of the adhesive securing the device layers.

By carefully controlling the chemical structure of the adhesive and films, AR’s second generation technology provides ample hydrophilic character to render the entire microfluidic channel hydrophilic. This new technology is inherently and uniformly hydrophilic on all existing and newly created surfaces, presenting IVD manufacturers with new creative design options such as utilizing hydrophilic spacers at the walls of the capillary to provide the hydrophilic properties for the channel. Another benefit of AR’s second generation hydrophilic technology is increased die-cuttability capabilities to offer sharper cuts while minimizing downtime for blade cleaning.

This new hydrophilic technology may also reduce the potential for chemical and/or optical interference in diagnostic devices and is well-suited for use in microfluidic devices, blood glucose test strips, whole blood test cards, blood coagulation devices, and sealing for biological assays.

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