YES vapor deposition tools enable scalable development and manufacturing of microarray point-of-care diagnostics for use in COVID-19 testing

by Jonathan Diver, PhD

As the coronavirus pandemic grabs headlines throughout the world, health authorities, governments and diagnostic device manufacturers are intensely focused on how best to conduct testing to get accurate, timely and actionable results. The most specific and useful tests for infectious agents, including SARS-CoV-2, the causative viral agent of COVID-19, are based on isolation and detection of genomic DNA or RNA. Tests based on polymerase chain reaction (PCR) amplification have been rapidly developed and are already in use in many laboratories throughout the world, although availability and rollout has not always been smooth for technical and regulatory reasons. These tests are run in hospital or central laboratories by highly-trained professionals, typically in large batches, and can take many days between sample receipt and result availability. Now manufacturers are turning their attention to faster, simpler molecular test formats that have the advantage of being usable outside of the laboratory setting: in doctor's offices, at ports of entry, or even in the home.

Respiratory diseases can be caused by many bacterial and viral agents and, although SARS-CoV-2 is currently public enemy #1, a truly useful test for respiratory pathogens will need to be multiplexed and have the potential to detect the 20-30 other potential pathogens. This presents a design and manufacturing challenge: how to make PCR happen at specific locations in a manufactured device where signal detection is fast and simple. Microarrays of DNA probes in various formats are available where optical, or electrical signals are the detection means. However, less complex devices are in development where PCR does not require direct labels, and initial isolation of DNA/RNA from human samples is incorporated as part of the same system. A challenge with these systems, however, is how to chemically attach arrays of DNA probes to solid surfaces, typically plastics, glass or silicon, to achieve the necessary uniform distribution and stable binding of probes in each location.

Chemical vapor deposition (CVD) of bifunctional silane linkers overcomes these challenges by forming a uniform reactive monolayer interface between the device surface and the organic DNA primers. Compared to crude solution-phase "dip" type processes, CVD shows superior uniformity and far lower use of costly chemical precursors for comparable binding yields. YES manufactures CVD systems at scales suitable for laboratory R&D as well as high-volume manufacturing. The **YES EcoCoat** system incorporates gas plasma surface activation, vacuum CVD, and precision thermal control to achieve the extremely tight process engineering requirements necessary to achieve consistent performance of covalently-conjugated DNA or protein microarrays.

For more than 30 years, YES has provided hardware and process solutions for engineered surface modification with its CVD, plasma cleaning, and thermal curing products. Please visit our website for more information, call us at +1-925-373-8353 (888-937-3637 US toll-free) or email sales@yieldengineering.com to learn how YES can help address your development or manufacturing needs.

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