Reducing Adhesion of Proteins in Medical Diagnostic Equipment with Dursan

A SILCOTEK® CASE STUDY WITH:

This case study is a summary of a larger study done in partnership with Abbott Laboratories. You can read our TI summary here or the full paper here.

SUMMARY:

There are many industries that protein adhesion to a surface can affect, including food, marine, and medical industries. Abbott Laboratories, a medical device manufacturing company, and SilcoTek worked together on a study to demonstrate how to prevent protein fouling caused by adsorption on stainless steel with the Dursan coating process.

CHALLENGES:

Protein adhesion effects can look different for every customer in different environments. Some customers have different levels of acceptable protein adhesion depending on the specific industry and its requirements. Abbott Laboratories wanted to solve this surface issue when working with medical devices in a modern clinical laboratory that use immunoassay formats to amplify the detection when working with many bodily fluids. The use of immunoglobulins allows for highly sensitive and specific capture of molecules, but potential non-specific binding of unwanted molecules can interfere with performance and lower the level of detection. Eliminating the binding of these protein molecules would allow for interference-free amplified detection in medical devices.

GAME-CHANGING BENEFITS:

To look for increased protein resistance, the Abbott group performed tests on a Quartz Crystal Microbalance with Dissipation monitoring or QCM-D, which is a highly sensitive mass sensor that can detect mass uptake or release by interpreting changes in the quartz resonance frequency. The sensors were coated in a thin layer of 316L grade stainless steel and then coated via chemical vapor deposition with SilcoTek's Dursan process.

GAME-CHANGING BENEFITS:

After treating the QCM-D sensors with a protein solution and gauging the protein adhesion, the following was established. As seen in Image 1 below, a combination of Dursan coating and a wash step containing a non-ionic surfactant facilitated 100% removal of tested proteins. Shown in Image 2, comparison studies between Dursan and AF 1600 (a competitive fluoropolymer coating) showed that sonication degraded the protein resistance properties of the AF 1600 due to delamination, but had no negative impact on Dursan demonstrating the coating's robust performance. This study shows what an inert coating can do for stainless steel equipment in any protein adhesion environment, creating fewer false positive tests due to protein carryover and contamination.

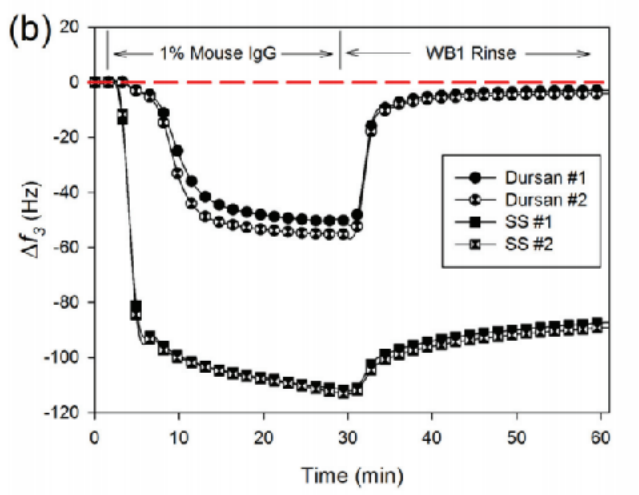

Image 1:The combination of Dursan coating and non-ionic surfactant in the wash solution led to effective reduction of protein loss to the sensor surface.

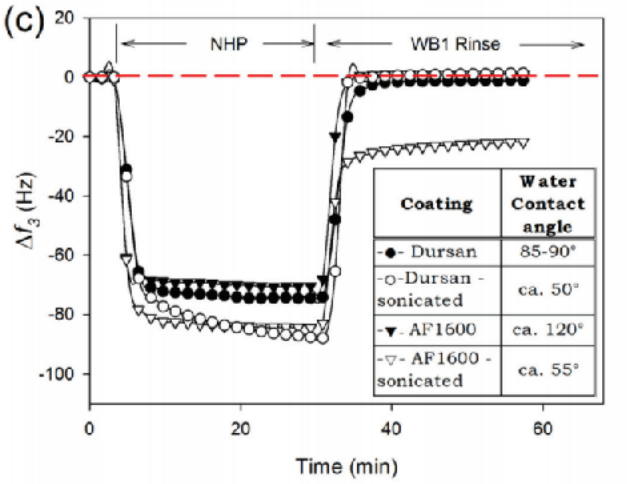

Image 2: Wear resistance test using sonication showed robustness of the CVD Dursan coating. In contrast AF1600 coating lost efficiency due to coating delamination.

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