



Yield Engineering Systems, Inc.

Surface Tension Modification for the Biotech, DNA and Biochemistry industry.

To help to give a picture of what surface tension is, let's compare Teflon and sand paper. Teflon is really slick and water will not stick to this surface. The contact angle of water to Teflon is high (over 100 degrees) and water slides off easily. The contact angle of sand paper is low, (below 10 degrees) and water will stick to the surface. When we modify surfaces using plasma we drive the surface towards a sand paper type surface with tiny bullets of ionic energy. This is why plasma is an essential in bonding Teflon to Teflon. The lower the contact angle the better bond achieved. To attain the opposite effect, another method of surface modification is to treat the surface with a silane, which usually sticks to the surface and leaves dangling molecules of different material exposed on the surface. In the case of HMDS (hexamethyldisilazane) exposed to a silicon wafer, the silane portion sticks to the silicon and it leaves Methyl molecules sticking out. The Methyl molecule will be slicker than the silicon molecule so the contact angle increases. It is possible to expose the surface for longer and longer times and drive the contact angle over 100 degrees.

Surface tension modification is desired by many in the medical field. Medical devices, which are designed to work with blood or other liquids, may have the problem of constricting the blood flow or movement due to a high surface tension. This can be improved dramatically by changing the surface tension and allowing the liquid to flow more easily or be directed in a certain way. To expose the substrate to a silane through vapor deposition will cause the surface to become hydrophobic. Very often the substrate is first plasma cleaned as this gives a consistent clean surface.

The YES systems that are used are the YES-1224 silylation system and the 1000P plasma cleaning system. We can take a substrate and first measure the contact angle before plasma cleaning it. After it is plasma cleaned we can measure the contact angle again and see that the surface is cleaned (the contact angle has decreased) and ready for silylation treatment. The YES-1224 system is designed to first remove all moisture if there is any, and then expose the substrate to the silane vapor. Because the system is under a vacuum the exposed substrates will have a uniform reaction. After processing, the contact angle can be measured again to see that the surface is now hydrophobic (the contact angle has increased).

Substrates may be held in specially designed carriers or just placed on the system shelves. Only the exposed parts will be processed. We have even had success with treating the inside of very small tubes to allow blood to flow freely through them. This required a slightly longer process under vacuum to allow the vapor to get inside the small tubes.

There are many different applications where surface modification may be desired. Give us a call and we will be happy to set up a demo for you, or just send us the parts and we will process them for you. Just let us know what you are trying to achieve and allow our experts to recommend a process for you! Call us at 1 888 YES-3637!!