

What gas to use for plasma treatment

This topic has often caused an amount of controversy usually due to incomplete information. Many vacuum plasma treatments that claim to use only argon to achieve the desired surface treatment forget about the water vapour that is extracted from the polymer film. The plasma can crack the water vapour into oxygen and hydrogen. The oxygen will be available for modifying the surface in exactly the same way as if it had been one of the gases fed into the plasma cleaning process.

Argon simply is a heavy atom that when bombarding the surface can break bonds. Argon plasma has no mechanism for removing any hydrocarbons and so often material that is sputtered off the surface falls back onto the surface re-contaminating it. The use of oxygen allows the hydrocarbons to combine with the oxygen and form a volatile gaseous compound that can simply be pumped away. The oxygen may also bond to any dangling bonds that are formed and these will then allow a chemical bond to the metal giving the metal a method of bonding directly to the polymer. Surface analysis of the polymer/metal interface of these oxygen containing plasma treatments often show a metal oxide at the interface confirming this theory.

Not all plasma treatments are used to improve metal adhesion to the surface. Where a surface needs to have an improved adhesion to epoxies then using ammonia in the plasma can increase the presence of amino groups on the surface that are thought to covalently bond to the epoxies better.

Where a low friction or low adhesion surface is required then using fluorine in the plasma can help to reduce the surface energy. This type of plasma treatment is used in many medical applications to prevent drugs from sticking to the walls of the supply components to help make sure the patient receives the entire measured amount of drug and not just what was left after the drug coated all of the walls.