The plasma principle

Plasma is a gaseous mixture of atoms, molecules, ions and free electrons. A low-pressure plasma emerges if a gas is at low pressure (0.1 - 100 Pa) in an electrical field (such as a 50 kHz alternating field, 1000 V) **(see Fig. 1)**. The few free electrons and negatively charged ions existing in any gas are accelerated towards the cathode. All positively charged ions are accelerated towards the anode. On account of the low pressure, the particles have a long free path and are accelerated to around 100 eV. Should these highly energetic particles collide with the molecules of the gas, they likewise split them into ions, free electrons and free radicals. This way, plasma marked by a high proportion of reactive particles emerges.

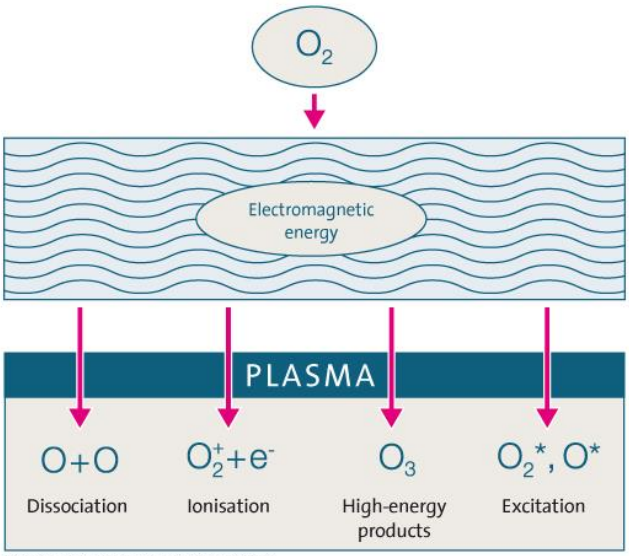

Fig. 1: Emergence of an oxygen plasma

The OVE method

The elastomer or plastic parts to be treated are placed in baskets and subsequently taken to the process chambers. These are evacuated. After that, some process gas is let in. At an internal pressure of 10 to 500 Pa (fine vacuum) the process gas is ionised by a high-frequency alternating field.

Oxygen is used as a process gas. As a result of the negative pressure, the ionised gas particles have a sufficiently long mean free path until they collide with other gas particles. The likelihood of a collision with the elastomer surface to be treated is therefore sufficiently high. Primarily oxidation processes and cracking take place on the elastomer surface. As a result, polar chemical groups form on the surface, in the form of carbonyl, carboxyl and hydroxide groups. The effect described also brings about, among other things, a measurable increase in the free surface energy. The depth of the effect amounts to only a few molecule layers.

Fig. 2 shows the fundamental structure of a plasma device, including gas supply, plasma processor and vacuum pump.

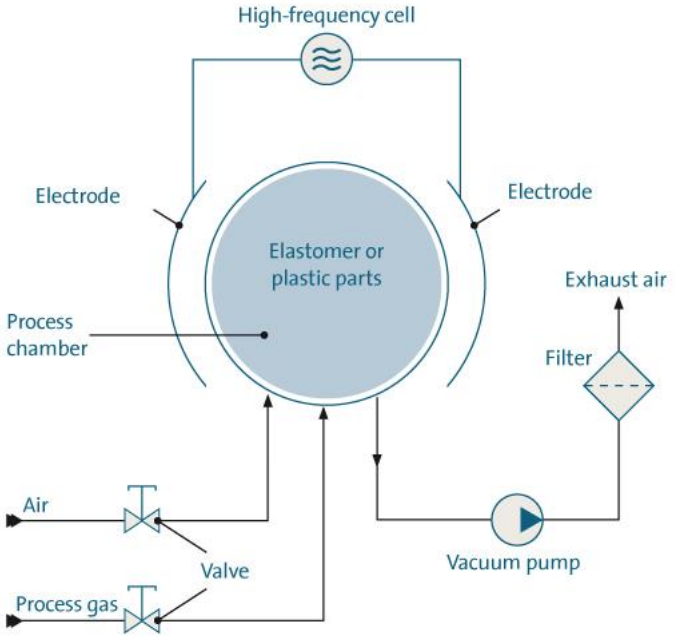

Fig. 2: Low-pressure plasma device

The reactive particles remove the dirt from the parts to be cleaned, either by reacting chemically with the dirt molecules or by "blasting" the dirt "away" by releasing their high kinetic energy upon impact. When removing the dirt by means of chemical reactions, the impurities are split up into water vapour, carbon dioxide and low-molecular volatile organic particles **(see Fig. 3)**. The cleaned surfaces are PWIS-free.

The proof of being PWIS-conform is provided through different specifications: VW PV 3.10.7, FESTO FN 942010-2, DÜRR QZ 24 or VDMA 24364-A1/B1-L.

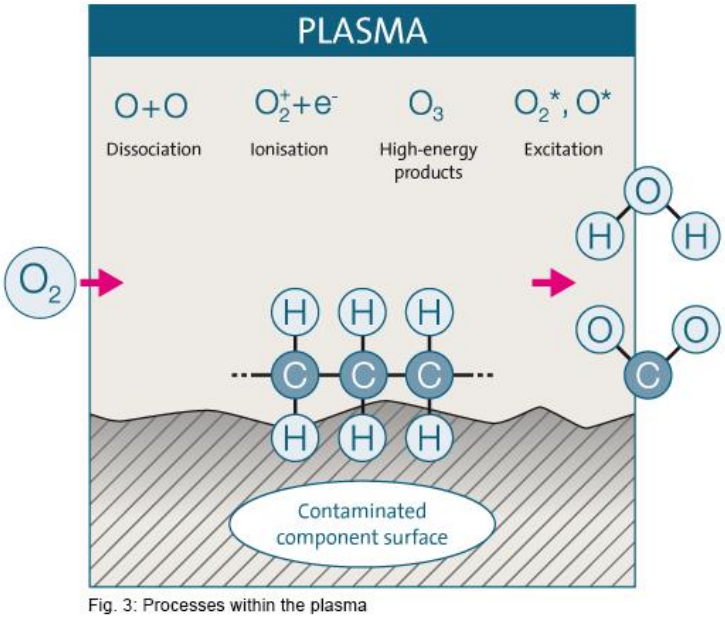

Fig. 3: Processes within the plasma