Medical Technology: Needles

Plasma activation of plastic hubs

After surface activation in low-pressure plasma, the surface tension of the syringe hubs improves and O-functional groups are integrated in the PE surface. This yields a significant improvement in the adhesive's bond strength.

Application

Steel needles have to be bonded to syringe hubs with high tensile strength to eliminate the risk of needle detachment during application. To achieve the desired bond strength, the polyethylene hubs are pretreated (activated) in plasma. Since plasma is gaseous, treating the interior of the hub is no problem.

Systems engineering

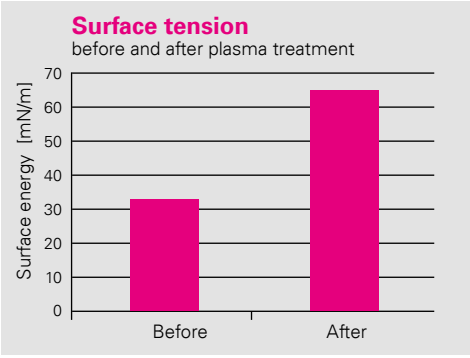
In this sample application the hubs are treated as bulk goods (in the V80-G rotary drum unit shown above). To this end, the hubs are poured into a drum, which rotates slowly during treatment. Loading and unloading are performed manually; fully automatic loading is optionally available.

The V80-G unit is designed for the plasma activation of PE hubs for hypodermic needles.

Plasma process

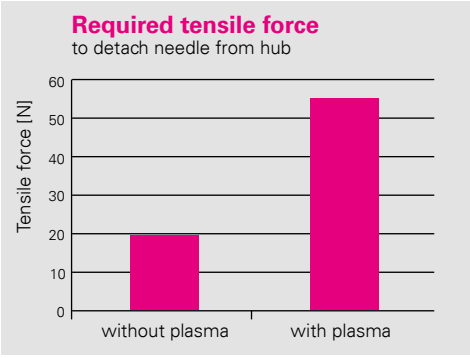
Treatment in oxygen plasma modifies the wettability of the polyethylene (PE) employed and polar functional groups are formed on the hub surface during the plasma process. The surface tension consequently increases from less than 32 mN/m to over 62 mN/m (Diagram 1).

Diagram 1



Of crucial importance for the adhesive's bond strength is not only the plastic's wettability, but also the presence of O-functional groups, as they encourage the formation of chemical bonds between the plastic and adhesive. This has a direct effect on the adhesion of the needle in the hub. The required extraction force to detach the needle from the hub increases from 20 N (untreated) to over 50 N in the case of a hub pretreated in plasma (Diagram 2).

Diagram 2



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