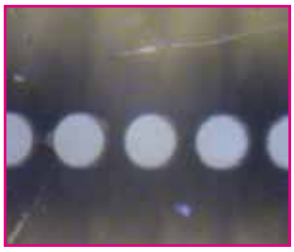

Fig. 1 and 2: The soot layer on laser-drilled films will be removed reliably.

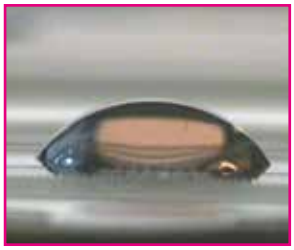

Fig. 3 and 4: The wetability of the foil improves significantly after plasma cleaning.

Drill hole cleaning

Plasma cleaning of laser-drilled film

Application

Textured polymer films, like those used in ink jet printer cartridges, for example, are manufactured by applying a laser as a drilling and cutting tool. As an unwanted side effect, some of the incineration ash remains on the film around the textures (fig. 1).

Plasma process

The primary aim of the plasma treatment is to remove this ash, which sticks more or less firmly to the surface. It is carbon based (soot) and therefore can be removed by oxidation. Oxygen plasma creates an utterly clean surface quickly (fig. 2).

As a positive side effect of oxygen plasma, the film gets activated simultaneously with the cleaning step. Wettability of the surface is increased significantly (figs. 3 and 4), supporting adhesion and overall behavior in the subsequent gluing process.

Compared to wet cleaning procedures, PINK's low pressure plasma provides a uniform cleaning performance, irrespective of the diameters and geometries of the laser drilled holes and structures. Capillary action is no criterion for plasma, as it is much more mobile than liquids are.

Using only oxygen as a process gas, the entire cleaning process is similarly economical and environmentally friendly. Besides oxygen, exhaust gases contain carbon dioxide (CO_2) and water as reaction products, so there are no additional scrubbing or disposal costs.

Systems engineering

For some applications, the films are coated by a thin copper layer, which must not be damaged by any production step. Along with other properties – very thin film, roll to roll treatment – there is an overall requirement for low heat exposure to avoid deformation of the film and its textures.

Microwave plasma fully complies with this requirement: With its electrodeless setup, it works at room temperature and prevents sputtering. In addition, processes are faster compared to MHz or kHz plasma frequencies, as ionization rates are higher.

PINK designs customized systems for this application. For example a system consisting of three chambers: One for unwinding, winding and intermediate plasma treatment, respectively. An interleave can be removed and supplied automatically.

Example for a reel-to-reel system by PINK.

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12.2016