USING DIFFUSE COPLANAR SURFACE BARRIER DISCHARGE FOR IMPROVEMENT OF FELTING PROPERTIES OF ANIMAL FIBRES

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The Diffuse Coplanar Surface Barrier Discharge (DCSBD) has shown its great potential for applications in textile industry recently[1]. A rather interesting synthesis of the latest technologies and a very traditional industry is currently being developed in cooperation of our physics department and TONAK - a company with more than 200 years tradition in the hat making from natural felt. This is also covered by international patent WO2011044859: An Apparatus and Method for Improving Felting Properties of Animal Fibres by plasma Treatment.

The DCSBD is driven with a sinusoidal high-frequency high voltage, the electrodes being covered in a dielectric to prevent arcing or sparking. This forms a thin but rather homogeneous (macroscopically speaking) layer of highly non-equilibrium plasma capable of changing the surface properties of materials brought in contact with it.

The traditional material used in the hat-making industry is a mixture of rabbit and hare hair. Unlike wool, this material does not felt spontaneously and needs modification. The current standard is pickling the fur in concentrated acids and then drying with hot air flow. The disposal of used chemicals and the energy consumption during the drying are rather expensive. The risk for the employees working with dangerous chemicals is also indispensable.

Replacing the traditional way with dry processing by the DCSBD represents a significant reduction of direct and also indirect costs, provided, the quality and the speed of the whole process is comparable to the traditional one.

To optimize the input parameters, several tests are currently being developed. Among others, measuring the surface energy by the Washburn method (speed of liquid soaking into the material), the colour adhesion to the fur and measuring the density and the strength in tension of the felted material.

1. M. Černák *et al.* "Generation of a high-density highly non-equilibrium air plasma for high-speed large-area flat surface processing", Plasma Phys. Control. Fusion 53 (2011) 124031 (8pp)

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