

## ATMOSPHERIC PRESSURE PLASMA IN PROCESSING OF CELLULOSE FIBERS: FROM SURFACE CLEANING TO TAILORED PROPERTIES

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**Abstract.** Plasma processing of textile materials, especially ones from cellulose (natural and man-made (or regenerated) cellulose fibers), has been the focus of many researchers in the past three decades (Shishoo 2007, Ul Islam & Haji 2024). Plasma treatments, as an alternative to conventional wet treatments in textile processing used to clean fiber surfaces or to tailor fiber surface chemistry and morphology, have many advantages, such as small energy consumption, short time of treatment, and small chemical consumption, which makes this process environmentally friendly. Among many different plasma configurations available, which can be classified according to several criteria, such as the type of energy supply (direct or alternating with different frequencies), temperature (hot (thermal) and cold (non-thermal) plasma), and pressure (low-pressure and atmospheric pressure plasma), atmospheric pressure plasma, especially dielectric barrier discharge (DBD), is highly promising for textile material modification thanks to its simple arrangements and adaptability of electrodes' shape, more homogeneous surface discharge with lower temperature electrons preventing localized overheating and damage of treated material as well as its potential for up-scaling and implementation in existing industrial facilities and continuous processes. In this paper, we present a comparative study on the functionalization of cellulose fibers by DBD treatment with special emphasis on the aging effect as an additional treatment parameter. By controlling the DBD variables, such as the nature of gas (air, oxygen, and nitrogen), discharge power, frequency, and exposure time, a great variety of surface effects can be achieved, such as surface cleaning and etching, introduction of new functional groups, increase or decrease surface energy, cross-linking, etc.

### References

- Shishoo, R. (Ed.): 2007, *Plasma Technologies for Textiles*, Woodhead Publishing Ltd., England.
- Ul Islam, S., Haji A. (Eds.): 2024, *Advances in Plasma Treatment of Textile Surfaces*, Woodhead Publishing Ltd., England.