PO1083

Surface engineering of textiles using He/Dodecyl acrylate plasma at atmospheric pressure

Prasanta Kumar Panda[1], Manjeet Jassal[2], Ashwini Kumar Agrawal[3]

[1]SMITA Research group, IIT Delhi, New delhi, India [2]SMITA Research group, IIT Delhi, New Delhi, India [3]SMITA Research group,IIT Delhi, New delhi, India

pkp.gd.pp@gmail.com

Hydrophobic functionalized cellulosic textiles have a wide range of applications in different sectors. Different techniques including wet chemical processing are used to impart hydrophobic functionality to textiles. However, surface modification using plasma is increasingly gaining importance, as it modifies the surface at nano level without altering the bulk properties. In literature, the hydrophobic functionality is achieved by grafting of precursor or deposition of hydrophobic polymer film formed by precursor using vacuum or atmospheric plasma. The functionality obtained by this method is not durable due to the weak adherence of the polymeric film on the textile substrate.
In this study hydrophobic functionalization of viscose fabric was carried out using non-fluoro long chain hydrocarbon dodecyl acrylate (DA) using He/DA glow plasma at low frequency & atmospheric pressure. After the treatment the water absorbency time of more than 1h and water contact angle is of 143º was observed. The functionality developed after the treatment was durable to solvent and soap washing. Effect of substrate and of various parameters such as concentration of precursor, helium flow rate, discharge voltage, discharge frequency and treatment time on treatment was investigated. Analysis of the plasma quality was carried out using oscilloscope. Fragmentation of precursor inside the plasma zone was analyzed using optical emission spectroscopy and GC-MS. The surface of the treated fabric was analyzed using XPS. Based on the above studies a suitable reaction mechanism has been derived, where it is proposed that the hydrophobicity was developed due to chemical reaction of fragments of DA with cellulose at specific sites. An attempt has also been made to understand the effect of various plasma parameters on the DA/He plasma and its effect on reaction of precursor with the substrate. Effect of plasma treatment on the tensile strength and surface morphology of the textile was also analyzed.

Keywords
atmospheric pressure glow discharge plasma
cellulosic textile
hydrophobic functionalization