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## **Plasma surface modification of cellulose and its application as filler in the polypropylene composites**

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Cellulose is the most widespread bio-polymer and has outstanding potential as thermoplastic reinforcement. At our department the modification of cellulose by microwave plasma discharge is studied in order to improve mechanical properties of cellulose-filled thermoplastic composites.

In the technological point of view, the interfacial adhesion is the fundamental parameter with a significant effect on mechanical properties of fabricated composites. Composites based on polypropylene are frequently grafted by organosilanes using wet chemical methods in order to increase interfacial adhesion. Maleic anhydride grafted-polypropylene (MAPP) is frequently used for this purpose.

Plasma functionalization is a promising method to modify the surface avoiding conventional wet chemical methods. It is possible to carry out the process using suitable precursor of organosilane groups (e.g. hexamethyldisiloxane). The key part of this research is the development of suitable design of plasma apparatus. Developed design plays a major role in terms of transportation of precursor to the substrate. It is difficult to study this behavior experimentally, so the computer simulation was firstly used for this purpose.

The main goal of this research is to establish organosilane groups on the cellulose surface by plasma functionalization in order to increase the interfacial adhesion in thermoplastic composites. The rate of cellulose functionalization was studied by XPS analysis. Fabricated composites were tested for tensile strength and Young's modulus. Failure modes and interfacial adhesion were studied by SEM. Mechanical properties of composites reinforced by plasma functionalized cellulose were compared to composites fabricated using MAPP. Both the theoretical and the experimental results are presented in this contribution.

### **Keywords**

Plasma functionalization; cellulose; polypropylene; composite material