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Atmospheric RF plasma effects on the film adhesion property of polymer metallization process

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Polymers frequently replace traditional engineering materials such as metals, glasses and ceramics. The utilization of polymers can further be enhanced by coating them by a protective layers, optical coatings, gas permeation barriers, and others. However, the desirable bulk properties of polymers are often compromised by unfavourable surface characteristics, such as low hardness, low resistance to abrasion and scratching, and low surface energy, that generally leads to poor adhesion.

For the overcoming of these problems, commercial polymer was pretreated by atmospheric RF Ar plasma mixed with reactive gas and Ti was synthesized by magnetron sputtering

The change of surface properties were monitored by contact angle measurements and its chemical variations were analyzed by IR, and XPS. Both modifications cause surface oxidation of polymer film, which is connected with formation of functional groups enhancing polymer wettability. This process is very fast and efficient in mixed Ar + O₂ RF plasma but relatively slower during polymer exposure to others. The interface reaction of sputtered Ti have been studied using high resolution X-ray diffractometer(HR-XRD) and X-ray photoelectron spectroscopy(XPS). The reactions of Ti with polymer lead to the simultaneous formation of TiCl₂(PVC), TiC, Ti-oxide. .