Anti-adhesive Layers on Stainless Steel Using Thermally Stable Dipodal Perfluoroalkyl Silanes

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The present study aims at anti-adhesive layers on steel, designed for molds and dies employed in polymer processing. Steel surfaces are modified with dipodal perfluoralkyl organosilanes and the resulting wetting properties and surface morphologies are analyzed. Dipodal silane monomers with different fluoroalkyl spacer lengths are synthesized via hydrosilylation reaction. The modification of stainless steel surfaces is performed in a two-step procedure comprising a corona activation of the steel surface and the subsequent reaction of surface hydroxyl groups with the dipodal silanes from the liquid phase. Anti-adhesive behavior on the surface is achieved through the modification. The attachment of the dipodal silanes on the stainless steel surface are validated with infrared reflection absorption spectroscopy and X-ray photoelectron spectroscopy. The wetting properties of the dipodal silane layers are investigated by contact angle measurements and adhesive force measurements. Atomic force microscopy is used to characterize the surface roughness and morphologies. Stainless steel modified with the dipodal perfluoroalkyl silanes exhibits low surface energy and low adhesive force compared to the unmodified steel surface. The thermal stability of coatings based on dipodal silanes is significantly higher when compared to layers based on conventional monopodal organosilanes. It is shown that perflouroalkyl silane coatings exhibit remarkable durability under thermoplast processing conditions, paving the way towards numerous applications in this field.

B. Kaynak, S. Waschke, G. Grundmeier, W. Kern, *AIP Conference Proceedings*, **2016***, 1779*, 020018-1 – 020018-5.
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