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论文

193 nm激光引发PET表面的化学接枝

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摘要:

将聚对苯二甲酸乙二醇酯[Poly(ethylene terephthalate), PET]材料置于氨气气氛中, 利用激光光子同时激发材料表面及氨气形成自由基, 用激光引发反应并促进氨基在材料表面的接枝. 改性后的测试结果表明, 材料表面粗糙度没有显著变化, 但水接触角的减小表明表面化学结构发生了某种变化. 傅里叶变换红外光谱(FTIR/ATR)图谱在3352和1613 cm^{-1}处出现了新的氨基吸收峰, 证实了表面接枝了氨基. 同时X射线光电子能谱(XPS)也证明了材料表面C—N键的存在, 其C_{1s}结合能为285.5 eV, N_{1s}为398.9 eV. 飞行时间二次离子质谱(Tof-SIMS)也检测到含氨基的分子碎片, 其碎片成像图显示接枝仅发生在激光辐照部位. 实验结果表明, 激光能在生物材料表面进行局部区域的选择性接枝.

关键词: 193 nm激光 表面接枝 聚对苯二甲酸乙二醇酯 氨基

PET Surface Chemistry Grafting Induced by 193 nm Laser

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Abstract:

Surface physical and chemical properties have very important impacts on biocompatibility of biopolymers. In this article, a 193nm excimer laser was used for the PET surface modification. The PET film was irradiated in a vacuum chamber filled with controlled ammonia flux. Surface roughness measurement, water contact angle, FTIR/ATR, XPS and Tof-SIMS were used to characterize the modified PET film surface. Water contact angle decreasing indicates that the chemical composition changed after laser irradiation in ammonia and no significant surface roughness was observed. The character amino group vibration absorption bands were displayed in FTIR/ATR spectrum at 3352 and 1613 cm^{-1}, respectively. XPS binding energies of C_{1s} at 285.5 eV and N_{1s} at 398.9 eV verified the C—N bond's formation on the PET film surface. Fragment ions mapping in Tof-SIMS also shows that the proofs of amine molecule fragments could be extracted from the laser irradiated PET surface. All the results prove that the excimer laser can be used as a useful tool for the biopolymer surface modification and chemical patterning.

Keywords: 193 nm laser Surface grafting Polylethylene terephthalate(PET) Amino

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