

材料化学工程与纳米技术

用二维FTIR研究纳米TiO₂改性丝素蛋白聚集态结构转变

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摘要

采用溶胶-凝胶方法制备纳米TiO₂复合丝素膜。UV和SEM测试结果表明, 该丝素膜中纳米TiO₂均匀分散在丝素中, TiO₂粒径约为80 nm;同时采用一维红外光谱、二维红外相关光谱对纯丝素膜及复合丝素膜结构进行表征。结果表明, 随着纳米TiO₂的生成, 丝素蛋白中弱氢键缔合的N—H键以及自由的N—H键发生断裂及重组, 生成了强氢键;丝素分子从无序状态转变为有序排列, 同时无规线团构象及 α 螺旋构象向 β 折叠构象发生转变, 最后促使丝素蛋白的结晶构象从Silk I转变为Silk II。

关键词

[二维红外相关光谱](#) [丝素](#) [纳米TiO₂](#) [复合膜](#)

分类号

Two-dimensional FTIR correlation spectroscopic study on structure of nano-TiO₂ modified silk fibroin films

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Abstract

Regenerated silk fibroin/nano-TiO₂ composite films in different ratios were prepared by sol-gel method. UV-Vis spectroscopy and SEM observations revealed that the nano-TiO₂ particles are well dispersed in the regenerated silk fibroin. Diameter of the nano-TiO₂ particles was determined as about 80 nm. FTIR and two dimensional FTIR correlation spectroscopic studies indicated that the formation of nano-TiO₂ particles leads to the aggregation structural changes of silk fibroin, in which strong hydrogen bonding was reconstructed from the rupture and rearrangement of the weak and free hydrogen bonding of the N—H groups. At the same time, the alignment of the silk fibroin molecules tends to be in an ordered form, and the crystal structure of fibroin in the composite films were transformed from Silk I to a typical Silk II form.

Key words

[two-dimensional FTIR correlation spectroscopy](#) [silk fibroin](#) [nano-TiO₂](#) [composite films](#)

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