# Thesis Abstract (English)

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論文題目

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Preparation of Modified *p*-Aramid Fiber as Reinforcing Material for Polymer

論文要旨

Thesis Abstract

With the increasing demand of FRP composites for both civil and military users, *p*-aramid fiber as a high performance fiber has attracted high attention during recent years due to its characteristics of low density, high strength, high heat resistance and toughness. However, because of the chemical inert surface and fibrillar structure, *p*-aramid fiber always exhibits a much poorer compressive strength relative to its tensile strength, which finally results in low affinity with the resin matrix. In order to obtain a modified *p*-aramid fiber which can be used as a commendable reinforcing material for polymer with a high interfacial adhesion, attempts on the approaches of improving the interfacial adhesion have been presented in this thesis which mainly consists of two approaches.

The first approach was focused on the modification of p-aramid fiber (Kevlar) by electron beam irradiation. As a primarily investigation, the effect of electron beam irradiation crosslinking with TMAIC on the mechanical properties of Kevlar fiber was discussed. It is found that after electron beam modification, the crosslinker (TMAIC) can be successfully grafted on Kevlar fibers which can be clearly observed from FT-IR and XPS spectrums. In addition, a distinctly decreasing of fibrillation rate and little stretched fibrils after BFPO test were observed due to the further crosslinked and bound by those grafted TMAIC. What's more, the interfacial adhesion strength between Kevlar fibers and PP resin in a composite improved by approximately 70 % comparing with the untreated Kevlar fibers.

The other approach to modify the *p*-aramid fiber is preparing *p*-aramid aerogel with high specific surface area by sol-gel process and supercritical carbon dioxide

drying. The effect of hydrogen bonds on the volume shrinkage of *p*-aramid aerogel was examined. It could be concluded that to weaken the hydrogen bonds or enlarge the molecule structure to a certain degree was an efficient way to decrease the volume shrinkage of *p*-aramid aerogel. What's more, rather than changing the concentration of hydrogen bonds by altering the initial concentrations of strong hydrogen acceptor, monomer grafting by electron beam irradiation exhibited much more significant influence and made the aerogel more stable.