Mechanical properties of NR/PET fiber composite using grafted PET fiber under EB irradiation.

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Abstract Mechanical Properties of NR/PET fiber composite were studied. First, PET fiber was grafted under EB irradiation. The mechanical properties of composite were improved with the addition of grafted fiber into NR.

Experimental PET fiber (1500d, 500f, crystallinity 70%), natural rubber(NR) and 3-acryloxypropyltrimethoxysilane(APSi) were used. PET fibers were immersed in APSi solution of 2mol/l and a graft-polymerization was carried out at room temperature under irradiation by electron beam (EB) at 500kGy. After EB irradiation, PET fibers were post polymerized in an oven at 60℃ for 30mim and washed. Then PET fibers were cut in 1~2mm and mixed into NR.

<Mixing PET fibers with NR and cure treatment> NR and cure agent (silane coupling agent content 20,10,5 phr) were mixed with untreated fibers or APSi treated fibers by a roll mill with a heater at 100℃. The fiber content was 2%,6%,10%. These mixing materials were cured by a hot press apparatus at 160℃ and 80kgf/cm^2 for 30mim to get samples. The cured rubber samples were used to measure a tensile property.

Results and Discussion Fig.1 shows stress-strain curves when APSi treated fibers were mixed into NR in the case of silane coupling agent content of 5 phr. The initial elastic modulus decreased a little in the fiber content of 2%, but it clearly increased in the fiber

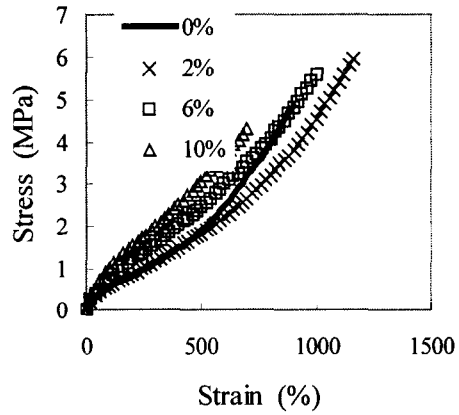

Fig. 1 Stress – strain curves

content of 6% and 10%. The mechanical properties were improved by mixing APSi treated fibers. Breaking stress and strain increased in the fiber content of 2% and decreased with increase of the fiber content. But breaking stress and strain in the content of 2% and 6% were higher than in the additive-free sample. The adhesion and compatibility between APSi treated fibers and the cure rubber containing the silane coupling agent were expected. In fact, the mechanical properties were improved due to the interaction mentioned above.