Sintesa Nanokomposit Epoxy-Organo Clay-Cycloaliphatic Amine dan Karakterisasinya

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Abstrak

Epoxy-organo clay nanocomposite materials are constructed from a polymer as a matrix and an organoclay as filler. Epoxy-organo clay nanocomposites have been synthesized using various curing agents. The aim of this research was to study the influence of the curing agent and the organoclay contents to the structure and mechanical properties of nanocomposites materials. Epoxy-organo clay nanocomposites were synthesized using cycloaliphatic amine as a curing agent and a montmorillonite organoclay (MMT) as filler through an in situ polymerization method. XRD and TEM technique provide more detail information to understand the structure that relates to the mechanical properties of the materials. Tensile test, compressive test and hardness test were conducted based on ASTM and JIS standards. The fracture surfaces after tensile tests were analyzed using SEM. The nanocomposite properties were compared to glass-fiber composites which were synthesized using wet-laminating method.

It was found that the curing agent is influence to the nanocomposites structure which was shown by the change of d-spacing before and after the addition of the agent curing. XRD and TEM techniques showed that both intercalated and exfoliated structure have been formed. TEM image also exhibited that the number of intercalated structure was higher when the organoclay content was higher. It can be said that TEM techniques provides a better understanding of the nanocomposites structure and the number intercalated structure increase as the organoclay increases.

The organoclay contain also influences to mechanical properties of nanocomposite materials. The addition of 10.5 wt.% organoclay improved the tensile modulus by 185% but and decreased tensile strength by 186% and 49%, and these values are lower of 36% and 90% compared to glass fiber composites. These decreases in the strength may be attributed to the fact that agglomerate and void was formed. From compression test, the addition of 3.1 wt.% organoclay demonstrated a 102% increase in compression strength and a 93% increase in load maximum compare to epoxy resin. But, that compression strength value lower of 11% compared to glass fiber composites. For the maximum load, the addition of 3.1 wt.% organoclay improved 246% compared to glass fiber composites. Addition of 7.3 wt.% organoclay demonstrated an increase of modulus of the epoxy resin by 93% and 2% compare to glass fiber composites. Meanwhile, the addition of 10.5% organoclay cause decreasing in yield compression up to 31%, but this higher value equal to 406% from is glass fiber composites. While that, result of hardness test do not show the make-up of value meaning in comparison with epoxy matrix.