

Sintesis non-halogen fire retardant composite melalui modifikasi resin poliester tak jenuh dengan penambahan $\text{Al}(\text{OH})_3/\text{Mg}(\text{OH})_2$ dan filler carbon black = Synthesis of non-halogen fire retardant composite by modification of unsaturated polyester resin by adding $\text{Al}(\text{OH})_3/\text{Mg}(\text{OH})_2$ and carbon black filler

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Abstrak

Poliester tak jenuh memiliki aplikasi luas namun mudah terbakar. Aditif halogen awalnya digunakan untuk meningkatkan fire retardancy komposit namun memiliki efek samping negatif terhadap kesehatan. Pada penelitian ini dilakukan sintesis fire retardant composite dengan variasi konsentrasi aditif $\text{Al}(\text{OH})_3/\text{Mg}(\text{OH})_2$ dan filler carbon black. Parameter fire retardancy yang diamati adalah time to ignition (ti), time taken to retard the fire (tr), burning time (tb), dan flammability rating menurut standar UL-94V. Komposisi aditif terbaik diperoleh pada konsentrasi $\text{Al}(\text{OH})_3$ 40%/Mg(OH)₂ 10% dengan ti 22,5 detik, tr 6,2 detik, tb 7,8 detik, dan flammability rating V-0. Penambahan filler carbon black sebanyak 2,5% meningkatkan fire retardancy komposit dengan nilai ti 30 detik, tr 1,4 detik, tb 3,5 detik, dan flammability rating V-0. Penambahan aditif dan filler CB mampu meningkatkan stabilitas termal komposit dengan menurunkan mass loss rate (MLR) dan total mass loss. Komposit resin/aditif terbaik ($\text{Al}(\text{OH})_3$ 40%/Mg(OH)₂ 10%) memiliki nilai tensile strength sebesar 18,2 MPa dan hardness 51. Sedangkan komposit resin/aditif/filler terbaik ($\text{Al}(\text{OH})_3$ 40%/Mg(OH)₂ 10%/CB 2,5%) memiliki nilai tensile strength sebesar 13,9 MPa dan hardness 55.

.....Unsaturated polyester resin has wide application but is flammable. Halogen additive was originally used for improving the fire retardancy of the composite but has the negative effects on health. In this research, synthesis of fire retardant composite has been conducted by varying additive $\text{Al}(\text{OH})_3/\text{Mg}(\text{OH})_2$ and carbon black filler concentration. Fire retardancy parameters need to be observed are time to ignition (ti), time taken to retard the fire (tr), burning time (tb), and flammability rating as per UL-94V standard. Additive composition shows the best result at the concentration of $\text{Al}(\text{OH})_3$ 40%/Mg(OH)₂ 10% with ti value of 22.5 s, tr 6.2 s, tb 7.8 s, and V-0 flammability rating. Adding carbon black filler of 2.5% improves the fire retardancy of composite with ti value of 30 s, tr 1.4 s, tb 3.5 s, and V-0 flammability rating. Adding of additive and CB filler can improve the thermal stability of composite by reducing mass loss rate (MLR) and total mass loss. The best resin/additive composite ($\text{Al}(\text{OH})_3$ 40%/Mg(OH)₂ 10%) has tensile strength value of 18.2 MPa and hardness 51. Whereas, the best resin/additive/filler composite ($\text{Al}(\text{OH})_3$ 40%/Mg(OH)₂ 10%/CB 2.5%) has tensile strength value of 13.9 MPa and hardness 55.