

# 15 Effect of carbon nanotubes, aluminum hydroxide, and zinc borate on the mechanical and fire properties of epoxy nanocomposite

From the book [Nanocomposite and Nanohybrid Materials](#)

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<https://doi.org/10.1515/9783111137902-015>

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## Abstract

This chapter discusses the fabrication of nanocomposites composed of carbon nanotubes (CNT), aluminum hydroxide ( $\text{Al}(\text{OH})_2$ ), and zinc borate ( $2\text{ZnO}\cdot 3\text{B}_2\text{O}_3\cdot 3.5\text{H}_2\text{O}$ ) with enhanced mechanical and fire characteristics. Using the melt condensation process, 2.5%, 5%, and 7.5% carbon nanotubes, aluminum hydroxide, and zinc borate were added to the 95% to 85% epoxy resin matrix. To understand the produced nanocomposite's flammability property, a JIS UL-94 test is conducted. The yield point of 36.5 MPa was reached by the carbon nanotubes/epoxy samples; they showed increased tensile strength; and the carbon nanotubes composite also produced ductility cracks. Carbon nanotubes with a concentration of 7.5% and epoxy with 90% achieved a higher Shore-D hardness value of 119. The results of the three-point bending tests made it clearly evident that carbon nanotubes made of composite materials had the highest flexural strength and modulus. In addition, it was discovered that the burning property increased with the concentration of nanofillers. For epoxy with 10% zinc borate, flame retardant property was shown to be effective.

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