# Cross-Linked Poly(methyl methacrylate) Nanocomposites, Synthesis, Characterization, and Antibacterial Effects

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**Abstract:**
Polymer networks were synthesized using the condensation method between PMMA and melamine as cross-linkers. CuO nanoparticles (NPs) and activated carbon (AC) were used as a filler. The final products PMMA/Mel, PMMA/Mel-CuO, and PMMA/MelAC were tested for antibacterial activities against *E.coli* and *S. aureus.* The chemical structure and composition, thermal properties, and surface morphology of the new PMMA/Melbased nanocomposites were investigated by various techniques. The XRD and EDX results showed the successful incorporation of CuO NPs and AC into the polymer matrix. Also, the thermal stability of the PMMA/Mel polymer was significantly enhanced after adding CuO nanoparticles. This finding showed that the PMMA/Mel-CuO and PMMA/MelAC nanocomposites have greater activity against both bacteria than PMMA/Mel. The PMMA/Mel-CuO and PMMA/Mel-AC polymers showed high activity against *S. aureus* bacteria, with inhibition zones of 22.6 mm and 11.3 mm, respectively. This confirms that small-sized nanoparticles have an effective role in killing bacterial cells.

**Keywords:** cross-linked PMMA; melamine; CuO nanoparticle; activated carbon; antibacterial; *E. coli*; *S. aureus*

**References**

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