ABSTRACT

Microorganism contamination on substrate surfaces is arousing increasingly concern as a serious health issue. In this research work, antimicrobial water-based acrylic paint containing silver nanoparticles was prepared using the facile Ag+ in situ reduction process, in which $AgNO_3$ and reducing agent sodium acrylate were refluxed with acrylic polymeric solution to obtain an antimicrobial and antifungal polymeric material for substrate coating. The Synthesized Antimicrobial and antifungal water-based acrylic paint were characterized by different spectroscopic techniques. The FTIR and UV-Visible spectroscopic analysis was investigated to study the water-based acrylic paint structure as well as the significant impact of silver nanoparticles on the paint matrix. The UV-Visible spectra peak at 224 nm and FTIR Spectra peak at 3310 cm^{-1}, 1670 cm^{-1}, and 1041 cm^{-1} shows successful integration of silver nanoparticles within the polymer matrix without altering the core functional groups of the paint. The water based acrylic paint exhibited a strong antimicrobial activity, revealed substantial inhibition zones against all four strains of Gram negative represented by Escherichia Coli, Acinetobacter Baumannii, Klebsiella pneumoniae and Gram-positive represented by Bacillus cereus. The coated film on substrate was also show great inhibition zone which exhibit a strong antimicrobial activity. Moreover, water based acrylic paint also exhibited a great antifungal activity, revealed substantial zone of inhibition against the Aspergillus Niger(A.N),Aspergillus Terreus(A.T) and Rhizopus Arrhizus (R.A) fungal strains. Also, the coated film showed the best adhesion at 50% and 80% solution of polymeric coating sample as compared to pure or very dilute sample coating. This innovative approach has the potential to revolutionize varies industries from healthcare to construction. Further research and development in this field could lead to the widespread adoption of such coating, contributing to improve public health and environmental sustainability.