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Antimicrobial polymer nanocomposites for the health-care sector

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Copper nanoparticles have been studied as antimicrobial additives for polymers aiming to diminish hospital acquired infections. Different technological challenges have been tackled. On one hand, copper nanoparticles tend to oxidize rendering copper oxide which is highly toxic. Therefore, they usually are coated with amorphous carbon which hinders their antimicrobial effect. On the other hand, copper nanoparticles are not compatible with polymers due to their different surface energy, thus forming agglomerates preventing the dispersion of nanoparticles into the polymer matrices. To solve both problems, their surface is usually modified to make them more compatible with polymers, as well as the use of ultrasound in solution mixtures. Our research group has contributed to solve the above-mentioned challenges. On one hand, thermal decomposition and chemical reduction have been used to synthesize copper nanoparticles. In the case of chemical reduction allyl-amines ligands have been used resulting in copper nanoparticles coated with amine-based polymers. In both cases, a high antimicrobial activity has been

obtained with low-toxicity and increases the compatibility with polymers. Besides, plasma polymerization of different gases on the surface of copper nanoparticles also increases their compatibility with different polymers. Finally, the use of ultrasound-assisted melt extrusion methods and ultrasound in the gas-phase help to break down agglomerates improving the dispersion. All the concepts have been used to produce textiles to be used in hospital environment based on core-sheath antimicrobial fibers against *S. aureus*, within a collaborative frame between México and the UK under ACT in Project.

Speaker Biography

Carlos A Ávila-Orta has completed his PhD at the age of 31 years from Centro de Investigación en Química Aplicada (CIQA), México. He had a postdoctoral position at the State University of New York at Stony Brook, USA. He served as the chairman of the Department for Advanced Materials at CIQA, México in the period of 2007-2014 and from 2017 up to date. He has over 80 publications that have been cited over 1800 times and his publication h-Index is 24. He has contributed to 4 book chapters in the fields of X-ray scattering analysis and nanotechnology.

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