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Utilization of designed Al-doped ZnO (MicNo®-AZO) particles for antistatic applications

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Nowadays, the development of technology and economy, electricity might cause some economical and vital risks via formation of static charges and electrostatic discharge (ESD) events. ESD events can cause firing, explosions, arc formation, breakdown of electronic circuits and devices. Moreover, electrical shocks, which may even end human lives. Therefore, should prevent these events. Antistatic products are currently used as an effective method for preventing ESD events. To avoid ESD events static charges should be grounded slowly. Through moderate resistivity of antistatic materials ($10^4<\rho<10^{11}$ ohm), they provide slow decay of the static charges. A recent promising approach is using conductive polymer composites (CPCs) which consist of polymer matrices and conductive filler materials. Generally, carbon based materials and metal nanoparticles used as conductive filler in CPCs. In addition, conductive oxides (COs) are utilized for electronic applications such as solar cells, optical coatings, sensors, photovoltaic cells. Furthermore, one of the other application areas for these materials is antistatic coatings. Zinc oxide (ZnO) is one example of the conductive oxides and it can be used for this purpose due to its wide direct band gap energy (3.37 eV). Pure ZnO has relatively high electrical resistivity (≈104 ohm). Doping is one of the widely applied methods to enhance the electrical conductivity of ZnO. To date Al doped ZnO (AZO) nanoparticles have been used in CPCs as conductive fillers, because of its low electrical resistivity. Although nanoparticles can be considered as good fillers, unfortunately, they exhibit uncontrolled agglomeration problems due to their high surface energy. Since increasing conductive filler can result in filler aggregation and decreasing antistatic performance. Accordingly, we developed micron sized platelets of Al-doped ZnO particles (called MicNo®-AZO) which are composed of 30-40 nm primary particles. In this presentation, we will discuss electrical, optical and antistatic performance of MicNo®-AZO particles.

Biography

Pinar Sengun is currently pursuing MSc in Materials Science and Engineering at Anadolu University. She has expertise on the synthesis of inorganic powders by using different solution-based synthesis methods. She is working on syntheses of un-doped and/or doped zinc oxide (ZnO) powders with tailored morphologies and investigation of the effect of the dopant elements on electrical and optical properties of zinc oxide materials.

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