Invited

Metal Nanocluster Enhanced Photon Detection in Wide Gap Solids

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Wide gap solids frequently form the basis high energy particle and photon detector technologies. For example, dosimetry systems used for monitoring x-ray (and now proton) beam therapy use such solids; alumina being a classic example. For this material, excited electrons and holes generated by the particle interaction with the solid are stored in deep electron and hole states. These carriers can subsequently be thermally or optically released, recombine radiatively; the luminescence output is generally a linear function of the absorbed particle dose.

Such photonic detection is convenient, but current devices are large and exist only in discrete form. In order to scale down towards sub mm dimensions the efficiency of energy transfer between the incoming particle and the solid is required. In this work we show both experimentally and theoretically that "doping" the wide gap solid with high Z meta nanoparticles can dramatically achieve improved efficiency gain. We report here our work on synthesising a model system for Alumina doping with Au nanoparticles and our calculations of size dependent energy transfer from the Au to the wide gap solid, allowing us to predict optimum particle size and density.

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