

To study silver nanoparticles with zinc oxide hybrid nanostructure by X-ray excited optical luminescence at Taiwan Photon Source

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Abstract

The optical properties of noble metal–semiconductor hybrid nanostructures have been investigated in recent years. By employing the localized surface plasmon resonance (LSPR), this kind of material would cause the near edge band (NEB) emission to have a special performance. One of the popular topics is to investigate the variety in photoluminescence(PL) when the Ag nanoparticles(NPs) attach on zinc oxide (ZnO) nanorods. Although this topic has been studied by many groups, only a few researches talked about the nanoscale PL in this kind of material. In this study, we focus on the single ZnO nanorod attached Ag NPs to observe the nanoscale properties by the multifunctional TPS 23A X-ray nanoprobe. Apply this beamline we can easily get the X-ray excited optical luminescence, X-ray absorption spectroscopy and X-ray fluorescence. After the experiments, we find it really exist a difference in NEB emission after attaching Ag NPs on ZnO NRs. Finally we even do a combination between the results and the energy transfer mechanism to study this phenomenon. So we can expect the Ag NPs is really a key role in tuning the emission performance of the ZnO with LSPR.

Keywords - localized surface plasmon resonance, X-ray excited optical luminescence, Ag nanoparticles, ZnO nanorod, energy transfer