Seminar

Enhanced ZnO based UV photonics and related applications

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Wide direct band gap as well as large exciton binding energy and relatively high refractive index, are only a few of the intrinsic properties making zinc oxide extremely relevant for UV photonics and related applications. Despite numerous studies on ZnO since the first observation at room temperature of UV stimulated emission [1] in epitaxial thin film, resonant light-matter interaction via periodic patterning at the emission diffraction limit (~100nm), still remain a major issue whatever the material i.e. thin films or nanowires. We will review some of our latest results obtained towards this goal on waveguiding high quality epitaxial thin films grown on sapphire either by PLD or MOCVD. We will start with the observation of random lasing [1] and high gain and low loss [2] in such a thin film. We will then show how high gain and low loss can be used for a new kind of efficient optical energy transfer between ZnO and ultrathin luminescent films [3]. We will then finally discuss about the patterning issue of such high quality epitaxial thin film using top-down approach. While resonant patterning is desirable for a full control of the spontaneous emission rate, micron scale structuring combined with in-plane waveguiding can also lead to enhanced stimulated emission i.e. lower threshold and higher internal quantum efficiency [4]. Such waveguiding enhanced properties are especially relevant for solid state lighting and sensing applications.

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