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Effect of Hole-Transporting Layer and Solvent in Solution Processed Highly-Efficient Small Molecule Organic Light-Emitting Diodes

Minjun Jo[1], Wontae Hwang[2], Heeyeop Chae[1,2]

[1]School of Chemical Engineering, Sungkyunkwan University, [2]Advanced Institute of Nanotechnology (SAINT)

Organic light-emitting diodes (OLED) and polymer light emitting diodes (PLED) have been regarded as the candidate for the next generation light source and flat panel display. Currently, the most common OLED industrial fabrication technology used in producing real products utilizes a fine shadow mask during the thermal evaporation of small molecule materials. However, due to high potential including low cost, easy process and scalability, various researches about solution process are progressed. Since polymer has some disadvantages such as short lifetime and difficulty of purifying, small molecule OLED (SMOLED) can be a good alternative.

In this work, we have demonstrated high efficient solution-processed OLED with small molecule. We use CBP (4,4'-N,N'-dicarbazolebiphenyl) as a host doped with green dye (Ir(ppy)3 (fac-tris(2-phenyl pyridine) iridium)). PBD (2-(4-biphenylyl)-5-(4-tert-butylphenyl)-1,3,4-oxadiazole) and TPD (N,N'diphenyl-N,N'-Bis (3-methylphenyl)-[1,1-biphenyl]-4,4'-diamine) are employed as an electron transport material and a hole transport material. And TPBi (2,2',2''-(1,3,5-phenylene) tris (1-phenyl-1H-benzimidazole)) is used as an hole blocking layer for proper hole and electron balance. With adding evaporated TPBi layer, the current efficiency was very improved. Among various parameters, we observed the property of OLED device by changing the thickness of hole transporting layer and solvent which can dissolve organic material. We could make small molecule OLED device with finding proper conditions.

Keywords: Organic light-emitting diodes, Small molecule, Solution process