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Low-Hydrogen-Content SiN_x Films Prepared Under Low-Temperature Conditions and Its Application to Encapsulation Layers for Top-Emission Organic Light-Emitting Devices KAZUFUMI AZUMA, SATOKO UENO, MASAYASU SUZUKI, YOSHIYUKI KONISHI, SHINICHIRO ISHIDA, Shimadzu Corporation — We have succeeded in obtaining transparent SiN_x films under 110°C with the water vapor transmission rate (WVTR) of less than $1x10^{-5}$ g/m^2/d. To use the top-emission OLED encapsulation films, high transparency and low WVTR ($<10^{-5}$ g/m^2/d) are required in a low-temperature process. However, low-temperature-prepared SiN_x film contains more than 30at% hydrogen, which causes low density of the film. Furthermore, high-hydrogen-content film may have many hydrophilic function groups such as N-H, Si-H and O-H, which deteriorates the encapsulation property. We have developed a microwave-excited Surface-Wave-Plasma Chemical Vapor Deposition (SWP-CVD) system using $SiH_4/NH_3/Ar$. The hydrogen content of the SiN_x films could be controlled from 16 to 40 at% by changing the distance between the plasma and the substrate during the low-temperature deposition. It was clarified that the hydrogen content in the SiN_x film clearly corresponded to the WVTR result. The WVTR value became smaller with decreasing hydrogen content. We also evaluate the SiH_4+N_2 series for the synthesis of low-hydrogen-content SiN_x films. Details will be discussed at the meeting.

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