Phosphor-in-Glass 薄膜を用いて白色レーザ照明

Blue laser-driven white lighting using phosphor-in-glass films

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As a next-generation light source, blue-laser-driven laser lighting has attracted great attention in high-luminance applications, such as projectors, automotive headlights, laser TVs, and etc. However, efficient and robust color converters for laser lighting are not available yet. In this work, we developed a phosphor converter by directly sintering a YAG:Ce^{3+} phosphor-in-glass (PiG) film on a high thermal conductivity sapphire substrate. With advantages of low cost, easy fabrication, high efficiency and excellent reliability, a uniform white light with a high luminous flux of 1839 lm, a correlated color temperature (CCT) of 6504 K and a color rendering index (CRI) of 68 was obtained under 11.2 Wmm^{-2} blue laserexcitation. By adding an orange (Ca-α-sialon:Eu^{2+}) or red ($(Sr,Ca)AlSiN_3:Eu^{2+}$) phosphor layer to the film architecture, the CRI was further enhanced to be 74. Importantly, these outstanding performances could meet the standard of vehicle regulation, validating its great potential for application in automotive lighting or even general lighting.

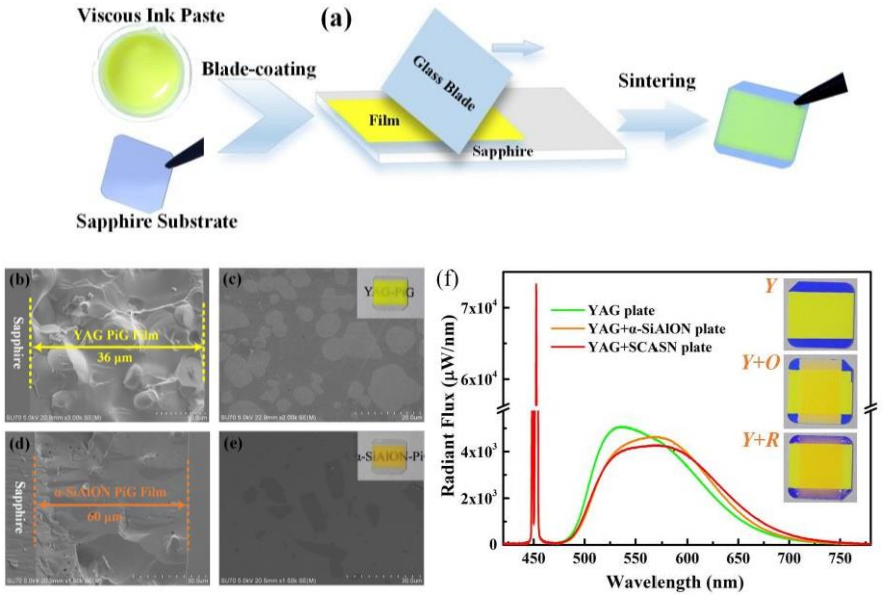

Figure 1 (a) Fabrication schematics of the phosphor-in-glass film on the sapphire (SA) plate; Cross-sections of (b) YAG-SA and (d) Ca-α-SiAlON-SA plates; Surface SEM images of (c) YAG-SA and (e) Ca-α-SiAlON-SA plates. The insets in (c) and (e) are the corresponding photographs; (f) Emission spectra of the three typical plates under 1.1 W laser excitation.