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UV-curable printed phosphorus-polymer thin film

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UV-radiation curing with photoinitiator and resins is used in variable industrial coating application. We develop a low-cost coating system through acrylate polymer doped with luminescent pigment and UV curing process for white LED manufacturing. We printed the curable phosphor thin film doped with specialized acrylate coating formulation on fused silica glass substrate using spray coating and UV curing process. A homemade UV LED curing system with a wavelength of 365 nm is developed for coating process. This UV LED curing system has less energy consumption and environmentally friendly comparing with conventional gas-discharged lamp based curing system. Aluminium reflectors are integrated with the curing setup, which increased the total radiant energy flux. The glass substrate covered with unpolymerized resin layer is fixed on the top of the planer reflector during the curing process. Even low level of UV exposure (irradiance <math><0.5\text{ W/cm}^2</math>) is sufficient for complete polymerization. The surface profile of cured thin film shows ultra-high homogeneity and low root mean square value. The transmittance of the cured thin film adapts to the luminescence properties of white LED.

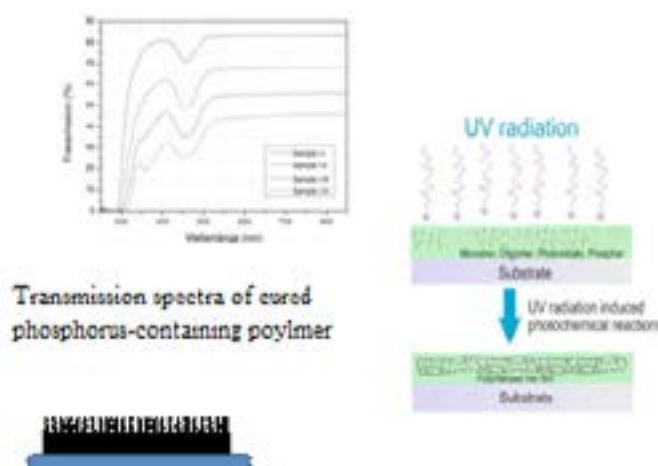


Figure 1: Schematic diagram of the UV LED curing experimental setup and transmission spectra of the phosphorus-polymer thin film.

Biography

Hao Bai is a fresh PhD student who has his expertise in optical spectroscopy and developing optical sensor systems for online quality control of printed polymers. He works currently at Light Technology Institute in Karlsruhe, Germany. His main research topics relate to optical characterization of polymer thin films, imaging and laser spectroscopy based monitoring system development for the UV curing process. The current research project is financed by German Federal Ministry of Education and Research.

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