

木质纤维素基近红外高透过滤光片

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摘要: 近红外滤光片在隐私保护、环境监测和夜视等领域具有重要应用;然而,传统的滤光片依赖于复杂的设计和对环境有害的基材,而木质纤维素衍生的滤光片往往无法满足所需的阻断波长。在这项研究中,我们引入了一种木质素捕获-融合策略,其中木质素在纤维素网络中自组装并融合形成致密、稳定的结构,并且通过简单调整薄膜厚度,以精确控制生物滤光片的波长阻断能力。由此产生的生物滤光片在可见光区域(400-650nm)表现出选择性阻断,高近红外透过率(超过 90%)和低雾度。此外,生物滤光片具有综合稳定性,包括水稳定性、溶剂稳定性、热稳定性和环境稳定性。由于其独特的性质,生物滤光片在近红外区域显示在数据安全、隐私保护和近红外夜视方面的巨大潜力。

关键词: 纤维素; 木质素; 近红外滤光片

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Lignocellulose-Based Ultra-High Near-Infrared Transmittance Filters

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Abstract: Near-infrared (NIR) filters have significant applications in fields such as privacy protection, environmental monitoring, and night vision; however, traditional filters rely on complex designs and environmentally harmful substrates, while lignocellulose-derived filters often fail to meet required blocking wavelengths. In this study, we introduce a lignin capturing–fusing strategy, where lignin self-assembles and fuses within a cellulose network to form a dense, stable structure. By simply adjusting the film thickness, we precisely control the wavelength-blocking capability of the filters. The resulting optical biofilters exhibit selective blocking in the visible region (400–650 nm), high NIR transmittance (over 90%), and low haze. Additionally, the optical biofilters show comprehensive stability, including water, solvent, thermal, and environmental stability. With these unique properties, the biofilters demonstrate great potential for applications in the NIR region, such as data security, privacy protection, and NIR night vision.

Key words: cellulose; lignin; NIR filter

