Highly stable bio-phosphors for high power Bio-Hybrid Light-emitting Diodes

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Bio-phosphors have emerged as an alternative to rare-earth color down-converting filters in light-emitting diodes (LEDs). They are mainly produced with biogenic emitters, like Fluorescent Proteins (FPs), embedded in polymer matrices.[1–3] The first bio-hybrid LED (Bio-HLED) with FP-phosphors featured a loss <10% of the emission intensity after 100 h.[1] This performance was recently enhanced using zero-thermal quenching PMMA-FP phosphors, reaching >150 days and 5 min of stability at low and high powers.[4] However, the ideal combination of highly efficient and stable fully biogenic phosphors is still in its infancy.[5] Here, we disclose the optimization of a new biopolymer hosting a stable eGFP mutant as green-emitting phosphor in Bio-HLEDs. The remarkable photoluminescent properties of the bio-phosphors - ϕ> 70% - lead to Bio-HLEDs with excellent photo-stabilities > 230 h operating under high powers, representing 2 orders of magnitude enhancement. We are strongly convinced that our work represents a crucial breakthrough in the development of *in toto* bio-phosphors.

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