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Fluorescent proteins-based luminescent hybrid materials: toward sustainable lighting technologies

Nowadays, light-emitting diodes (LEDs) represent the most widespread artificial lighting source worldwide. Nevertheless, even though they meet the customer's requirements in terms of efficiency and stability, their sustainability concerns – their production demands the use of rare-earth elements – need to be addressed. In this context, the down-conversion technology, based on the so-called phosphors, have been implemented. Up to date, only a few ecologically friendly down-converting materials have been explored, with fluorescent proteins (FPs) appearing to be a reliable, biogenic candidate due to their sustainable character. They however suffer from a lack of photo-, chemo-, and thermal stability.

Herein, we propose a way to stabilize green and red FPs by means of encapsulation into porous materials. First of all, mGreen Lantern and mCherry were encapsulated into silica by a new, simple process involving mild conditions. Owing to the simultaneous encapsulation of both FPs, a white bio-hybrid LED was realized with interesting properties. Next, the barely studied red bio-hybrid LED was achieved by inserting DsRed and mCherry into a metal-organic framework. In both cases, upon encapsulation, the stability of the FPs and their resulting devices were greatly enhanced.

Overall, these promising results can open up the door to more sustainable LEDs, which is crucial for a greener future.

References:

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