Novel materials for intensive and long-lasting chemiluminescence

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Abstract

For most of chemiluminescence (CL) reactions, light emission are flash. Intensive and long-lasting CL emission is highly desired for cold light sources, sensitive and accurate bioassays and CL imaging,1,2 but is still a great challenge. Most electrochemiluminescence (ECL) studies involve single luminophore with a unique emission spectrum, which severely limits its applications. Herein, we report recent progress regarding novel materials for intensive and long-lasting CL and multicolor ECL in our research group. First, a firefly-mimicking intensive and long-lasting CL hydrogel consisting of chitosan, CL reagent N-(4-aminobutyl)-N-ethylisoluminol (ABEI) and catalyst Co2+was developed.3 The light emission was observed by naked eyes in a dark room and lasted for over 150 hours when the hydrogels was mixed with H2O2. The intensive and long-lasting CL emission was attributed to the synergistic effect of catalyst Co2+, ABEI and the porous network structure of the hydrogels through a slow-diffusion-controlled heterogeneous catalytic reaction. Second, a novel nanoluminophore was synthesized by coating 5,10,15,20-tetrakis(4-carboxyphenyl) -porphyrin (TCPP) and ABEI on the surface of TiO2 nanoparticles, which exhibited unique potential-resolved multi-color ECL emissions using H2O2 and K2S2O8 as coreactants in an aqueous solution.4 Three ECL peaks, ECL-1 at 458 nm, ECL-2 at 686 nm and ECL-3 at 529 nm, were obtained with peak potentials of 1.05, -1.65 and -1.85 V. Potential-resolved multicolor ECL from a nanoluminophore was observed for the first time in an aqueous solution. Such new materials are of potential applications in cold light sources, bioassays, biosensors and biological imaging, optoelectronics, light-emitting devices and so on.

References

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