Nearly Quantitative Emission from the Crystals of Boron β-Diiminate Complexes

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Abstract

Solid-state luminescent molecules are essential for the development of advanced optical materials and devices, such as organic light-emitting diodes, chemical sensors, and organic lasers. Luminescent boron complexes have attracted attention because of their electron-accepting character and stimuli-responsive properties. However, there are still limited examples of efficient solid-state emission from boron complexes. We have developed solid-state emissive materials based on group 13 elements *β*-diiminate complexes with crystallization-induced emission.[1] Herein, we synthesized boron complexes with highly efficient luminescence both in the solutions and solids. We will describe their molecular design, synthesis and properties.

Results and Discussion

We synthesized boron complexes with aromatic groups at different positions as shown in Figure 1. **3PB** and **3Tol** exhibited efficient luminescence in solution at the room temperature, although **4PB** and **5PB** showed only negligible emission under the same condition (Table 1). Furthermore, **3Ph** and **3Tol** strongly emitted with nearly quantitative quantum yields in the crystalline states at the room temperature.

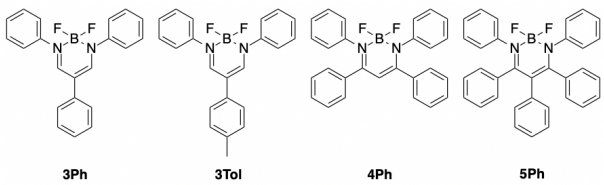

Figure 1. Chemical structures of synthesized complexes.

Table 1. Photophysical properties of *β*-diiminate complexes

	λ_{abs} [a]	λ_{PL} solution, [b]	Φ_{PL} solution,[c]	λ_{em} crystal, [d]	Φ_{PL} crystal, [e]
3Ph	398	495	0.48	501	0.99
3Tol	402	503	0.75	496	0.96
4Ph	376	n.d.[f]	<0.01	473	0.23
5Ph	370	464	<0.01	443[g]	0.66[g]

[a]Absorption maxima in solutions. [b]Photoluminescence maxima in the solution determined with excitations at λ_{abs}. [c]Absolute quantum yield in the solution determined with excitations at λ_{abs}. [d]Photoluminescence maxima in crystalline states determined with excitations at λ_{abs}. [e]Absolute photoluminescence quantum yield in crystalline states determined with excitations at λ_{abs}. [f]Not determined. [g]The crystals of **5Ph** contain 1 equiv. of dichloromethane molecule.

Reference

[1] Yoshii, R.; Hirose, A.; Tanaka, K.; Chujo, Y. *J. Am. Chem. Soc.* **2014**, *136*, 18131.