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Functionalization of Epindolidion: a New Colorimetric and Ratiometric Fluorescent Probe for Hg²⁺

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ABSTRACT

After functionalization, a new epindolidion derivative bearing a vinyl group was synthesized as a naked-eye fluorescent probe for Hg²⁺ through two steps. The probe showed good selectivity to Hg²⁺ over other metal cations in CH₃CN. On the basis of the addition of Hg²⁺, the fluorescence emission of the probe at 485 nm was ratio quenched along with the appearance of the new peak at 574 nm. Simultaneously, the absorbance of the probe showed bathochromic shift as a function of the increasing concentration of Hg²⁺. All of the features mentioned make this compound a useful probe for Hg²⁺ measurement. To the best of our knowledge, it's the first fluorescent probe based on epindolidion.

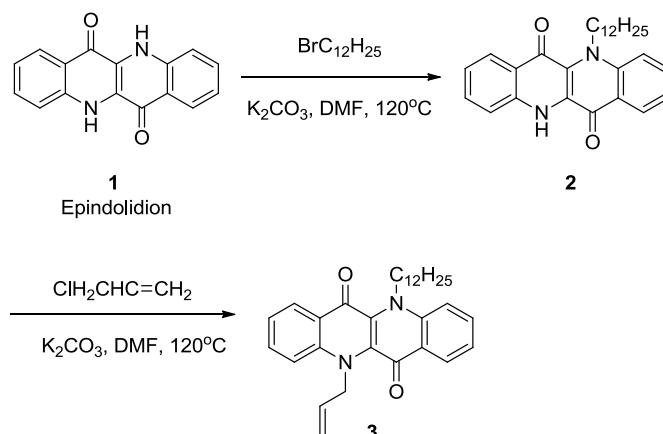
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1. Introduction

Many kinds of dyes and pigments have been functionalized into molecular devices and advanced materials, making “old dyes” into “new materials”¹. For instance, derivatives of chromophores, such as naphthalimide, peryleneimide, coumarin, quinacridone and diketopyrrolopyrrole, were widely introduced into photovoltaic materials²⁻³, organic soft materials⁴, fluorescent chemosensors⁵⁻⁶ and other functional materials⁷⁻⁸.

Epindolidion and its derivatives are a class of brilliant yellow pigments with strong fluorescence and show high performance, such as exceptional light, weather and heat stability for the intermolecular hydrogen bond^{7, 9-11}. For a long time chemists have focused considerable and consistent attentions on their synthesis and pigment performance, and only a few researches were reported on functionalization of epindolidions, making them to be wonderful potential materials for organic semiconductors, Field-Effect Transistors and Light-Emitting Diodes¹²⁻¹⁴. Based on exploration about synthesis optimizing of epindolidions in our group¹⁵, it is meaningful to do more researches on the fluorescence features of epindolidions in solution to widen their applications. Following our interest on chemosensors of different chromophores¹⁶⁻¹⁹, a derivative of epindolidion with good solubility was designed as a “naked-eye” colorimetric and ratiometric fluorescent probe for mercury ions. As one of the most toxic heavy metal elements, mercury can lead to the

dysfunction of the organism, so there is an increasing interest in the design and development of chemical probes for mercury ion²⁰. Moreover, to the best of our knowledge, there are no reports on the fluorescent probes based on epindolidion derivatives. Herein, a new epindolidion derivative was designed and synthesized, with an allyl group contacted on the N atom as Hg²⁺ receptor based on mercuration reaction²¹. The chemosensor **3** (Scheme 1) in this paper was found to be effectively colorimetric and ratiometric fluorescent probes for naked-eye detection of Hg²⁺.



Scheme 1 Synthetic routes of Epindolidion derivatives.

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