Mechanofluorochromic molecular materials as potential local stress probes

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Fluorescent materials, designed through appropriate molecular engineering, are able to signal different stimuli with a high sensitivity. In particular, a material is called "mechanofluorochromic" when its fluorescence emission changes upon mechanical stimulation (pressure, shearing force…). Mechanofluorochromic compounds have attracted a rapidly growing interest for the last five to six years, in particular for their possible use as mechanical sensors,[1] and several series of new molecules have been synthesized.[2] We are interested in a multiscale study of this phenomenon, in order to relate the molecular structure of a mechanofluorochromic dye to its sensitivity to different mechanical stimuli.

We synthesized a short series of difluoroboron β-diketone derivatives [3] bearing carbonyl substituents, which all demonstrate mechanofluorochromic behavior (Fig. 1). The photophysical properties of those novel compounds, in solution as well as in bulk solid, in thin films and in nanoparticles will be presented, along with studies by AFM coupled to fluorescence microscopy, which allow simultaneously following the changes of morphology of these materials and the changes of their fluorescence emission.

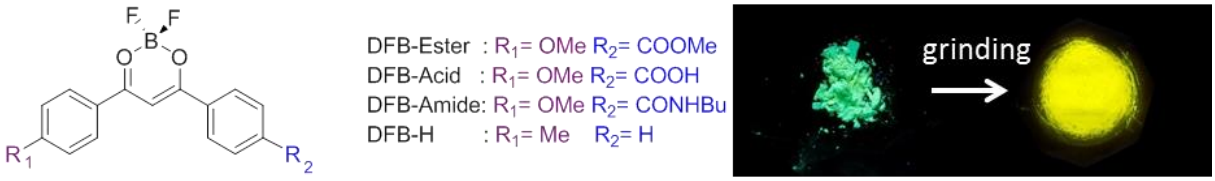

Figure 1: compounds synthesized and mechanofluorochromic behavior of the compound DFB-amide.

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