Mechano-responsive behaviors of platinum complexes possessing phenyl(isoxazolyl) groups

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Mechanochromic molecules have drawn a great research attention due to their potential in developing of pressure sensors and in gaining in-depth understanding of the mechanisms of them. However, relatively few studies have investigated the quantification of mechanical forces and the detailed mechanisms of the mechano-responsive nature. In order to endow the sensing capability to the mechanochromic molecules, continuous changes in the absorption/emission color changes in response to mechanical forces are required, which critically prevents mechanocromic molecules to quantification of mechanical forces because the vast majority of reports on the mechanochromic molecules document only the on–off nature of their absorption/emission color/intensity. Our approach to tackle the challenge relies on Pt–Pt interactions of our isoxazolyl benzene molecules. Pt complexes emit intense luminescence from a metal-metal-to-ligand charge transfer (MMLCT) excited state. The emission intensity of the MMLCT luminescence is determined by the Pt···Pt distance; accordingly, mechanochromic molecules premised on Pt complexes would illustrate continuous changes in their emission color/intensity in response to mechanical forces, leading to the mechanical force sensors as analytical tools. In this presentation, we will report a square-planar platinum complex possessing triethylene glycol chains that exhibits mechanocromic behavior in the amorphous phase. The mechanochromic nature was established by luminescence spectroscopy and powder X-ray diffraction analysis as well as computational chemistry techniques. The continuous changes in emission intensity permitted the platinum complex to be used as a sensor for mechanical forces, in which the output signals can be read by a luminescence spectrometer. These findings demonstrate the potential benefits of square-planar platinum complexes for the creation of mechanochromic materials.