Red emissive Cu(I)-pyridinophane-arylamide complexes and their application as mechanophores for mechanoresponsive polymers

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Mechanoresponsive polymers which can change their properties in response to applied mechanical force are of high interest for applications such as damage detection and stress sensing. While a number of mechanoresponsive polymer systems have been reported so far, many of them require covalent bond cleavage upon mechanoactivation often showing limited reversibility. Also, despite their potential applications such as bioimaging, examples of mechanoresponsive polymers which show emission in red to Near-IR region remain very limited. Previously in our group, copper(I)-NHC complexes were developed as mechanophores and incorporated into poly butyl-acrylate films to produce reversibly mechanoresponsive films relying on the suppression of the dynamic behavior of the complexes upon stretching.[1] In this work we explore a new series of copper based mechanophores with arylamide ligands, aiming for improved mechanoresponsive properties and emission in the red to Near-IR region.

Here, a series of copper(I)-pyridinophane-arylamide complexes **1-6** were synthesized. The complexes show orange to red photoluminescence with some even close to Near-IR, and moderate to good photoluminescence quantum yields. Substitution or π-extension of the carbazole ligand resulted in altering the emission properties of the complexes, enabling improved quantum yields and red-shift of the emission wavelength. The poly butyl-acrylate films incorporating complex **1** as mechanophore showed reversible change in photoluminescence intensity on stretching and releasing.

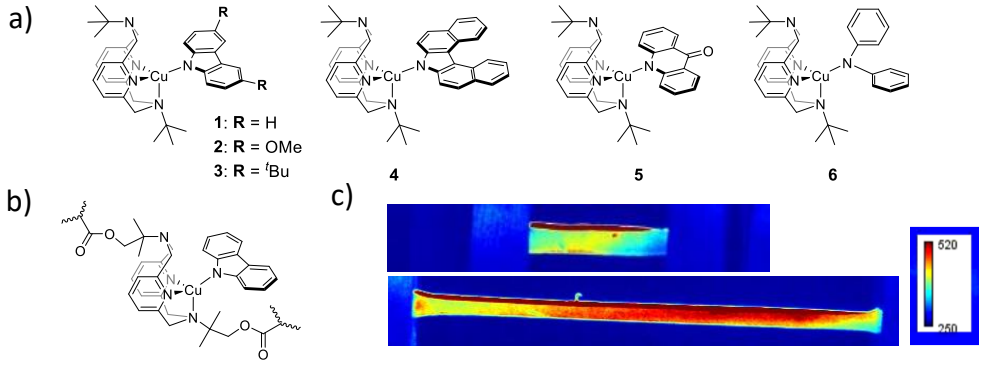

Figure 1. a) Structures of complexes **1-6**. b) Complex **1** incorporated in cross-linked poly butyl-acrylate. c) Change of emission intensity of **1** incorporated film on stretching.

1. Khusnutdinova, J. R. *et al Chem. Commun.* **2020**, 56, 50-53.