Study of luminescent Cu(I)-pyridinophane-arylamide complexes and their incorporation into polymer films: towards the development of mechanoresponsive materials

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Mechanoresponsive materials which change their optical properties in response to applied mechanical force are important for stress and damage sensing. Previously in our group, polybutylacrylate films incorporating photoluminescent copper(I)-NHC complexes as cross-linkers were developed.[1] The films show highly sensitive change of photoluminescent intensity upon stretching. The change is reversible and non-sacrificial, and the mechanism is considered to be suppression of the nonradiative decay by restricting the mobility of the complexes when stretching. However, there are still challenges such low miscibility of the complex in the polymer, which might arise from the cationic nature of the complex.

In this work, copper(I)-pyridinophane complexes bearing neutral arylamide ligands were synthesized as new mechanophores. The complexes show orange to red photoluminescence with the maximum wavelength up to 693 nm, representing limited examples of copper(I) red emitters. The properties of the complexes largely depend on the arylamide ligands, with the trend of complexes with more electron-donating ligands to give longer wavelength emission. The cross-linked poybutylacrylate films incorporating the complex **1** were prepared and found to show reversible change in photoluminescence intensity on stretching and releasing.

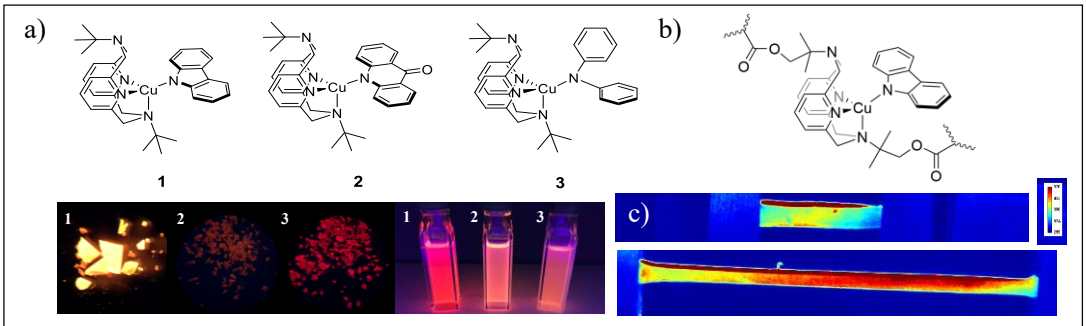

Figure 1. a) Structures and images of complexes **1-3**. b) Schematic structure of complex **1** incorporated in cross-linked poybutylacrylate. c) Change of emission intensity of **1** incorporated film on stretching monitored by CCD image sensor before and after streching.

1. Karimata, A.; Patil, P. H.; Khaskin E.; Lapointe, S.; Fayzullin, R. R.; Khusnutdinova, J. R. *Chem. Commun.* **2020**, 56, 50-53