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Reversible thermochromic polymeric thin films made of ultrathin 2D crystals of coordination polymers based on copper(I)-thiophenolates

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Abstract— A one-pot reaction between Cu(BF4)2·xH2O and 4-mercaptobenzoic acid in acetone or methanol gives rise to the formation of lamellar microcrystals of two Cu(I)-thiophenolate-based coordination polymers (CPs) with the formulas [CuCT] n (1) (CT = 4-carboxy-thiophenolate) and [CuMCT]n (2) (MCT = 4-methoxycarbonyl-thiophenolate). Both 1 and 2 show a reversible luminescent thermochromic behavior upon cooling, changing their color from pale yellow to green to orange in the case of 1, and from pale orange to green in the case of 2. It is shown that the lamellar character of these crystals, which exhibit micrometer lateral dimensions and sub-micrometer/nanometer thicknesses, allows processing them with an organic polymer such as polyvinylidene difluoride (PVDF) to form thermochromic 1@PVDF and 2@PVDF thin films. These thermal stimuli-responsive thin films are freestanding, free of macroscopic defects, and robust under mechanical bending stress, opening up the possibility to use them in, for example, 2D imaging sensor films.

Index Terms—

Citation:
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