Solvent-free “Liquid” π-Conjugated Molecules via Alkyl-π Engineering

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Our recent research interest is to develop novel ultimate-soft organic materials, i.e., room-temperature functional molecular liquids (FMLs) composed of a π-conjugated molecular unit bearing bulky, flexible, low-melting branched alkyl chains (Figure 1). There are no charged units on the molecule, thus FMLs show a clear contrast with ionic liquids (ILs) in terms of functions in their liquid form. The studies of multi-color tunable luminescent liquids based on blue-color emitting, electron-donor type liquids[1,2] and uncommon phase phenomena with the photoconducting property of liquid fullerenes[3] are designed simply by controlling a balance of intermolecular interactions in the alkyl-π compounds, i.e., van der Waals and π-π interactions among adjacent molecules, or “alkyl-π engineering”[4]. Here, the molecular design principle of FMLs based on an alkylated-π molecular systems as well as their luminescent and optoelectronic properties are presented. The π-unit molecular component described in this paper will be naphthalene[5], anthracene[2,6], pyrene[7], porphyrin[8], phthalocyanine[9], and fullerene[3]. The latest our attempt such as development of stretchable “liquid electret” devices will be also discussed in the presentation.

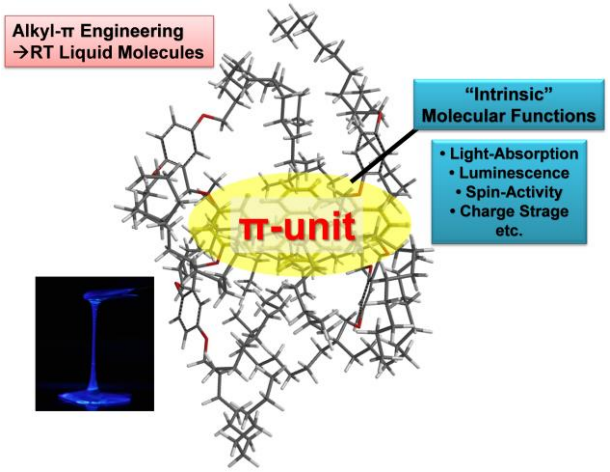

Fig. 1. A schematic drawing of alkyl-π functional molecular liquids and a photograph of typical blue emitting liquid.

References

1) *Angew. Chem. Int. Ed*., **2012**, *51*, 3391-3395. (Highlighted in *Nature*, **2012**, *484*, 9.); 2) *Nature Commun.*, **2013**, *4*, 1969.; 3) *Nature Chem.*, **2014**, *6*, 690-696.; 4) *Chem. Commun.*, **2017**, *53*, 10344-10357. (*Feature Article*); 5) *Phys. Chem. Chem. Phys.*, **2018**, *20*, 2970-2975.; 6) *Chem. Sci.*, **2018**, *9*, 6674; 7) *Sci. Rep.*, **2017**, *7*, 3416.; 8) Patent Applied, 2017-124302.; 9) *Chem. Asian J.*, **2018**, *13*, 770-774.