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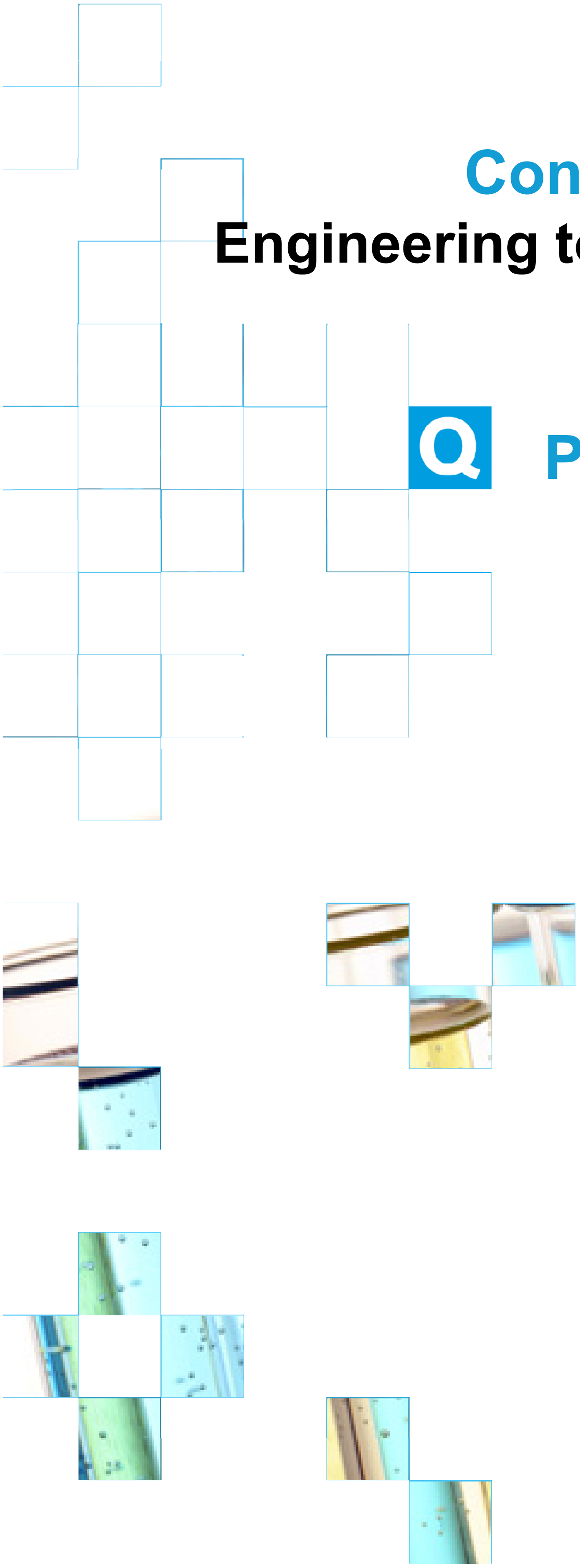

Conferencia: From Crystal Engineering to Function Engineering with Halogen Bonding

Pierangelo Metrangolo

Politecnico di Milano - Italia

05/12/13

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Aula de Seminarios do CIQUS

12:15 h

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From Crystal Engineering to Function Engineering with Halogen Bonding

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Similarities between halogen bonding and hydrogen bonding have been emphasized in several contexts.[1] However, it is the differences between these interactions that provide with an extra value for the design and construction of halogen-bond-based supramolecular materials. The main differences are that (i) halogen bonding is more directional than hydrogen bonding; (ii) the strength of halogen bonding can be easily tuned by simple single halogen-atom mutation; (iii) halogen bonding is more hydrophobic whereas hydrogen bonding is hydrophilic.[2] Each of these features has recently allowed taking some important advances over past applications of supramolecular chemistry in materials design. For example, the directionality of halogen bonding has provided with unique design tools for preparing photoresponsive, liquid-crystalline complexes from non-liquid-crystalline constituents, with truly unique optical performances.[3] Moreover, we have employed the tunable interaction strength of halogen bonding to gain fundamental understanding of light-induced mass migration in photoswitchable polymer-azobenzene complexes; namely no other noncovalent interaction allows controlling the polymer-chromophore interaction strength without altering the electronic properties of the chromophore.[4] The hydrophobicity of halogen bonds has in turn allowed us to devise the smallest ion transporter ever,[5] which, together with our recent work on halogen-bond-triggered supramolecular gelation,[6] opens up new avenues in the design of supramolecular systems.[7]

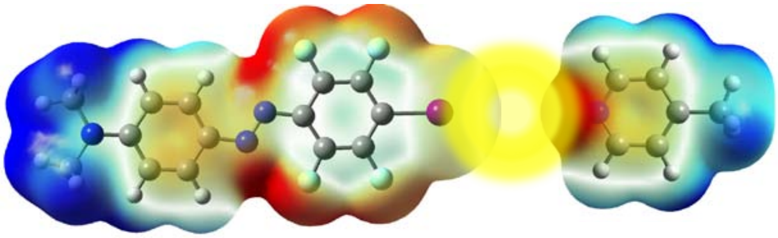

Figure 1. Halogen-bonded dimer between a pyridyl derivative (right) and a halogen bond-donor molecule (left) containing a photoswitchable azo group.

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3) Priimagi, A.; Saccone, M.; Cavallo, G.; Shishido, A.; Pilati, T.; Metrangolo, P.; Resnati, G. *Adv. Mater.* **2012**, *24*, OP345-352.
4) Priimagi, A.; Cavallo, G.; Forni, A.; Gorynsztejn-Leben, M.; Kaivola, M.; Metrangolo, P.; Milani, R.; Shishido, A.; Pilati, T.; Resnati, G.; Terraneo, G. *Adv. Funct. Mater.* **2012**, *22*, 2572-2579.
5) Meazza, L.; Foster, J. A.; Fucke, K.; Metrangolo, P.; Resnati, G.; Steed, J. W. *Nature Chem.* **2013**, *5*, 42-47.
6) Jentzsch, A. V.; Emery, D.; Mareda, J.; Nayak, S. K.; Metrangolo, P.; Resnati, G.; Sakai, N.; Matile, S. *Nature Comm.* **2012**, *3*, 905, doi:10.1038/ncomms1902.
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Since 2011 Pierangelo Metrangolo is the youngest full professor at the Politecnico di Milano. He is also visiting professor at the VTT-Technical Research Centre of Finland. He is author of 153 ISI publications cited 5904 times, H-index: 39. He is in the Editorial Board of CrystEngComm (RSC) and Topic Editor of Crystal Growth & Design (ACS). His awards include the 2005 “G. Ciamician” medal of the Division of Organic Chemistry of the Italian Chemical Society. From 2013, he is European Research Council grantee (StG). His research interests include crystal engineering, supramolecular and biomimetic materials.