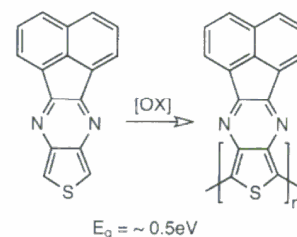
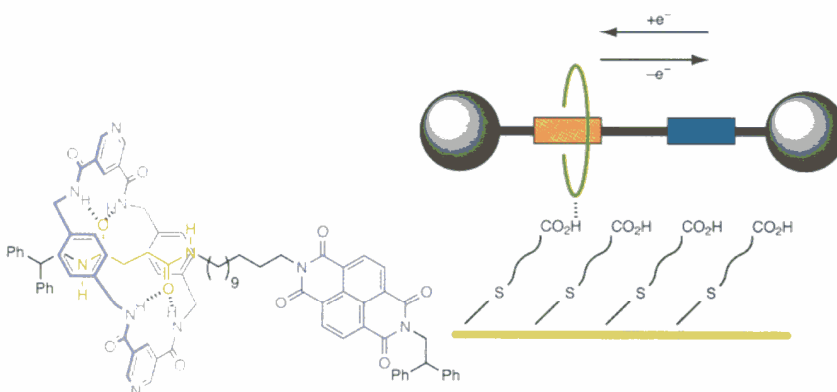


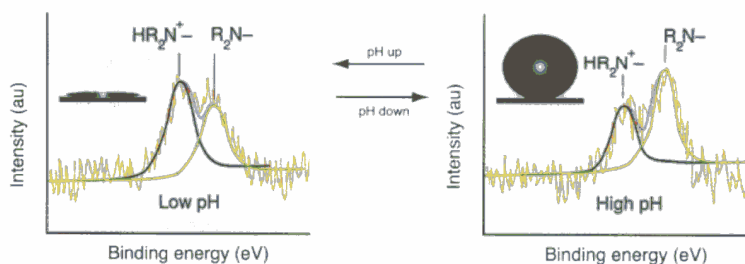
Scheme 3



Scheme 4



Scheme 5



Scheme 6

E Climent, M D Marcos, R Martínez-Máñez, F Sancenón, J Soto, P Amorós, J Cano, E Ruiz; *J Am Chem Soc*, 2008, **130**, 1903 (Scheme 3). The pH-driven open/close mechanism arises from the hydrogen-bonding interaction between amines at neutral pH (open gate) and Coulombic repulsions at acidic pH between closely located polyammoniums at the pore openings (closed gate). In addition to the pH-driven protocol, opening/closing of the gate-like ensemble can also be modulated via an anion-controlled mechanism. The choice of anionic guest results in a different gate-like ensemble behaviour, ranging from basically no action (chloride) to complete (ATP) or partial pore blockage, depending on the pH (sulfate and phosphate). The remarkable anion-controllable response of the gate-like ensemble can be explained in terms of anion complex formation with the tethered polyamines.

### Low band gap conjugated polymer

Conjugated polymers continue to attract significant attention due to their desirable optical and electronic properties, which has led to their application in light-emitting diodes, photovoltaic devices, sensors, electrochromic devices and field effect transistors. A new

conjugated polymer with a low band gap of 0.5 eV has been prepared via the electropolymerisation of acenaphtho[1,2-b]thieno[3,4-e]pyrazine (Scheme 4) (J P Nietfeld, C L Heth, Seth C Rasmussen; *Chem Commun*, 2008, 981). This band gap value is the lowest reported for a simple homopolymeric conjugated polymer.

### Molecular shuttle

A [2]rotaxane, which features succinamide and naphthalene diimide hydrogen-bonding stations for a benzylic amide macrocycle that can shuttle and switch its net position both in solution and in a monolayer, has been reported (G Fioravanti, N Haraszkiwicz, E R Kay, S M Mendoza, C Bruno, M Marcaccio, P G Wiering, F Paolucci, P Rudolf, A M Brouwer, D A Leigh; *J Am Chem Soc*, 2008, **130**, 2593). The three oxidation states of the naphthalene diimide unit can be accessed electrochemically in solution, each one with a different binding affinity for the macrocycle and, hence, corresponding to a different distribution of the rings between the two stations in the molecular shuttle. Switching is both reversible and cyclable – Scheme 5. Unlike previous electrochemically active amide-based molecular shuttles, the reduction potential of the naphthalene diimide unit is sufficiently positive (-0.68 V) for the process to be compatible with operation in self-assembled monolayers on gold. This was made possible by incorporating pyridine units into the macrocycle permitting attachment of the shuttles to an acid-terminated self-assembled monolayer of alkane thiols on gold.

### Tunable wettability

A novel pH-responsive surface with tunable wettability, reversible switching between high hydrophilicity at low pH and high hydrophobicity at high pH, has been developed (Scheme 6) (F Xia, T Sun, W Song, T Zhao, M Liu, L Jiang, *Chem Commun*, 2008, 1191). Such surfaces are achieved by fabricating a poly(N,N0-dimethylaminoethyl methacrylate) (PDMAEMA) thin film on roughly etched silicon substrates. PDMAEMA homopolymer is a weak polybase, which undergoes a phase transition owing to protonation at low pH and deprotonation at high pH of tertiary amine groups, and can interact with anionic substances by electrostatic attraction at low pH. Reversible switching between high hydrophilicity at pH = 2 and high hydrophobicity at pH = 9 can be well realised. This property is a result of the combined effect of the chemical variation of the surface and the surface roughness. Potential uses of these stimuli-responsive surfaces with tunable wettability include microfluidic devices, controllable separation systems, biotechnology, and other biomaterial applications.