Switching on the Fluorescence of 2-Aminopurine by Site-selective Microhydration


2-Aminopurine (2AP) is widely used as a site-specific fluorescent probe of DNA and RNA base-flipping and -folding. The group of S. Leutwyler showed that 2AP is not intrinsically strongly fluorescent, contrary to widespread belief. Gas-phase, jet-cooled 2AP and 9-methyl-2AP have very short fluorescence lifetimes (156 ps and 210 ps, respectively) rendering them essentially non-fluorescent. However, the lifetime of 2AP increases dramatically when it is part of a hydrate cluster, $2AP\cdot(H_2O)_n$, where $n = 1–3$. Selective microhydration of 2AP at its sugar-edge, cis-amino or trans-amino sites increases the fluorescence lifetime by up to 100-fold.

Revealing the Dynamic Structure of Complex Solid Catalysts using Modulated Excitation X-ray Diffraction


X-ray diffraction is a valuable tool to unravel the structure of solid catalysts under operation conditions. However, it is typically limited in the case of finely dispersed systems. A modulation excitation approach coupled to phase sensitive detection has been used to capture small Pd nano-particles of ca. 1–2 nm (2 wt%) supported on ceria-zirconia under an oscillating CO–$O_2$ feed. By eliminating the contribution of the static response of the ceria-zirconia bulk, this approach evidences very subtle changes that are associated with the Pd(111) reflection and the Ce$^{3+}$/Ce$^{4+}$ pair. The redox kinetics of the full material can thus, be described in greater detail.

Inducing Axial Chirality in a ‘Geländer’ Oligomer by Length Mismatch of the Oligomer Strands


A new concept how to introduce axial chirality was presented by the group of M. Mayor. Their Geländer-type oligomer interlinks three terphenyl rings with an oligo(benzyl ether) as a single bridge. The induced length mismatch of the oligomers is compensated by twisting the longer strand around the shorter resulting in a continuous twist of the entire structure. As a result, the molecule exists exclusively in the form of two stereoisomers, a pair of enantiomers – for the first time such a system cannot adopt an achiral meso form. A high racemization barrier allowed the chiral separation of both enantiomers, which undergo subsequent uniform interconversion over the course of several hours.

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