FAST TO ULTRAFAST DYNAMICS OF PALLADIUM PHTHALOCYANINE COVALENTLY BOUND TO MCM-41 MESOPOROUS MATERIAL

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Palladium phthalocyanine (PdPc) covalently bonded within MCM-41 mesoporous structured silicates has been studied by UV-vis steady-state absorption and fluorescence spectroscopy and by pico- and femtosecond time-resolved emission spectroscopy. Caging of PdPc by MCM-41 results in a splitting and a substantial broadening of absorption spectrum. Presence of new absorption band, appearing at 708 nm suggests large distortion of PdPc molecular symmetry inside the channels. For the emission, a bathochromic shift of ~ 40 nm is observed upon linking into the MCM-41 framework. Picosecond data shows an appearance of a new lifetime component of ~ 1.4 ns in comparison to PdPc in solution, which can be due to a specific interaction of guest dye with the host. New conformations inside MCM-41 are unique for covalently linked dye and not present in diffusion encapsulated nanocomplex. The fluorescence up-conversion study shows two time-scales of ultrafast dynamics. The 170 – 500 fs component has been assigned to intramolecular vibrational-energy redistribution (IVR) and S_2-S_1 internal conversion (IC) processes, while time constants of 1.5 – 4.4 ps are due to the vibrational relaxation at the S_1 manifold. We believe that these results can be potentially useful in development of new nanosystems.

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