

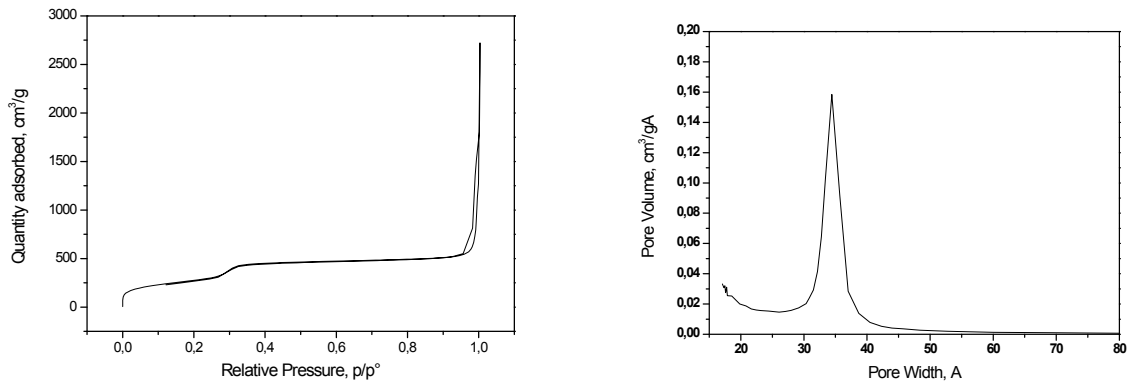
Supplementary Material

Preparation of IRIS3-loaded MCM-41 NPs.

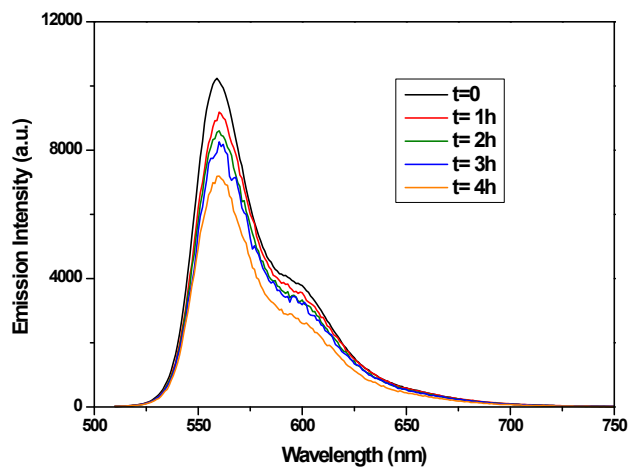
IRIS3-loaded MCM-41 nanoparticles were prepared as previously reported elsewhere [1]. In a typical procedure, MCM-41 nanoparticles were outgassed overnight at 300°C in order to remove adsorbed water and then they were incubated with a solution of IRIS3 dye in toluene. The solution was stirred at R.T. in N₂ atmosphere for 2 h. The solid hybrid was then filtered off and washed several times with fresh toluene and methanol, until no free dye was found in the supernatant. The solid material was dried under vacuum at R.T. overnight. The actual loading was evaluated by UV-Vis absorption analysis of the filtered solutions after the physical adsorption and washing procedures.

Table S1. Concentration of IRIS3 dye water solution used in photodegradation experiments at any irradiation interval.

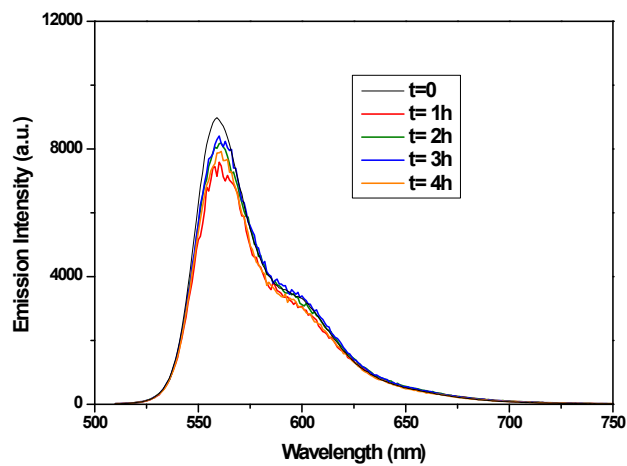
Time of irradiation (h)	Concentration (μM)	
	Irradiation in air	Irradiation in N ₂
0	2.00	2.00
1	1.65	1.50
2	1.38	1.50
3	1.20	1.45
4	1.02	1.38



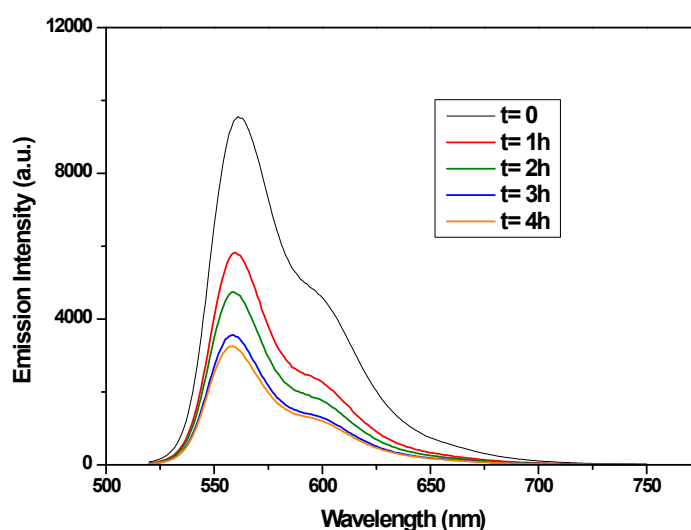
S1 Volumetric data. Left: N₂ adsorption/desorption isotherm; Right: Pore size distribution.



S2 Emission spectra of fMSNP suspension at different irradiation time (in air)



S3 Emission spectra of fMSNP suspension at different irradiation time (in N₂)



S4 Emission spectra of fMSNP suspension at different irradiation time (in the presence of TiO₂)

S5 Complete set of Lifetime data

Sample	Irradiation time	τ_1 (ns)	%	τ_2 (ns)	%	χ^2
Dye	-	0.24	100	-	-	1.12
fMSNP (air)	0h	0.60	60	1.70	40	1.09
	1h	0.60	55	1.72	45	1.10
	2h	0.62	48	1.70	52	1.04
	3h	0.61	45	1.73	55	1.03
	4h	0.62	42	1.75	58	1.05
fMSNP (N ₂)	0h	0.60	60	1.70	40	1.11
	1h	0.61	60	1.70	40	1.08
	2h	0.60	59	1.72	41	1.04
	3h	0.60	58	1.71	42	1.03
	4h	0.60	58	1.70	42	1.09
fMSNP (TiO ₂)	0h	0.60	60	1.70	40	1.08
	1h	0.60	58	1.71	42	1.09
	2h	0.62	52	1.70	48	1.02
	3h	0.61	50	1.72	50	1.10
	4h	0.60	47	1.74	53	1.04

Preparation of IRIS3/A300 composite

IRIS3/A300 (Aerosil 300) composite was prepared as follows: A300 sample was outgassed overnight at 100°C in order to remove adsorbed water and then it was incubated with a solution of IRIS3 dye in toluene. The solution was stirred at R.T. in N₂ atmosphere for 2 h. The solid hybrid was then filtered off and washed several times with fresh toluene and methanol, until no free dye was found in the supernatant.

Lifetime measurements carried out on water suspension of the as-prepared material evidenced the presence of two lifetime values, the shorter one being ascribable to a fraction of dye weakly bound to the surface and readily released in the suspension, whilst the longer one is assigned to the dye adsorbed on the silica surface. After several washing, when no IRIS3 dye molecules were released anymore, the IRIS3/A300 composite is characterized by a single lifetime value (0.67 ns).

S6 Fluorescence Lifetime measured on IRIS3/A300 composite.

Sample	τ_1 (ns)	%	τ_2 (ns)	%	χ^2
Dye	0.24	100	-	-	1.12
IRIS3/A300 as-prepared	0.25	20	0.65	80	1.11
IRIS3/A300 washed	-	-	0.67	100	1.09

1. Miletto, E. Bottinelli, G. Caputo, S. Coluccia, E. Gianotti. *Phys. Chem. Chem. Phys.*, 2012, **14**, 10015