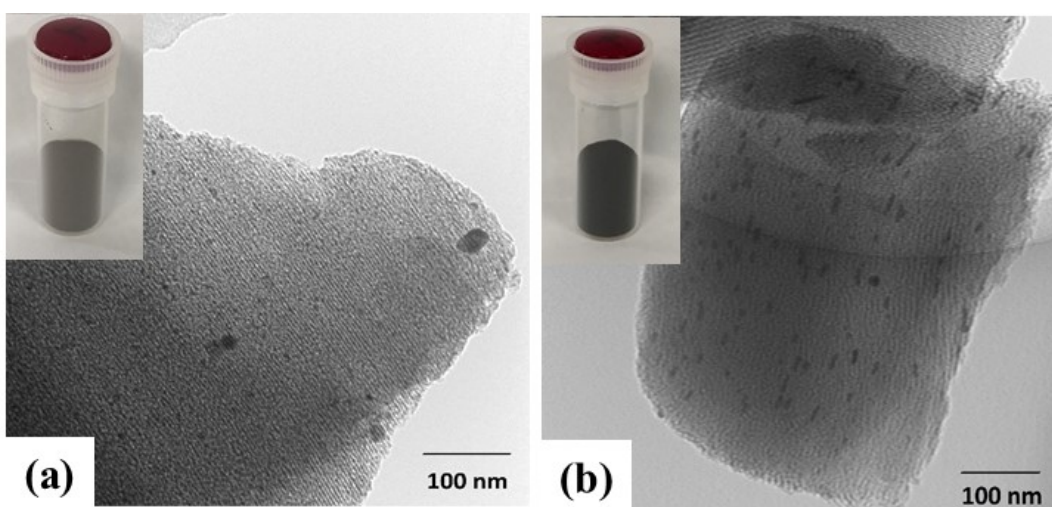


# Synthesis and Characterization of Pd/Ag Bimetallic Nanocatalyst on SBA-15 Mesoporous Silica as a Plasmonic Catalyst

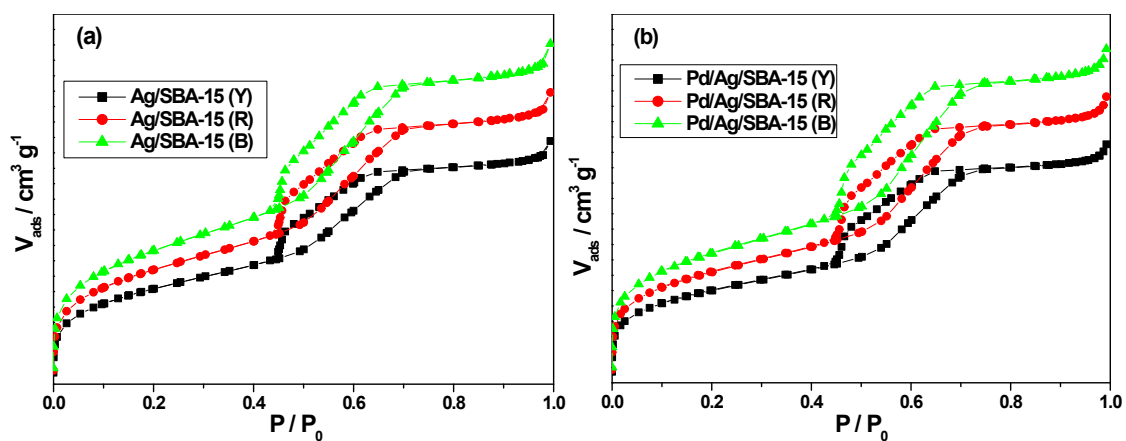
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**Figure S1.** TEM images and sample photographs (inset) of (a) Pd/Ag/SBA-15 (Y) and (b) Pd/Ag/SBA-15 (R)

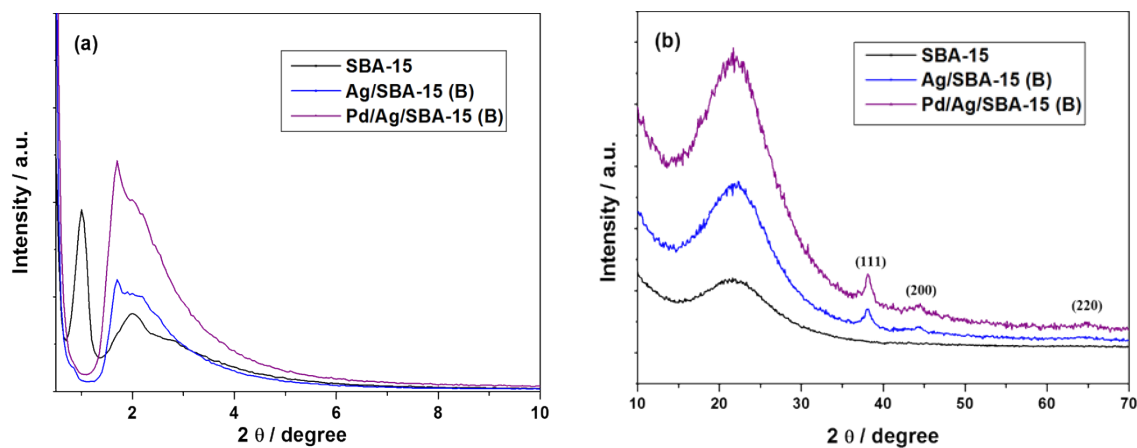


**Figure S2.**  $N_2$  adsorption-desorption isotherms at  $-196^\circ\text{C}$  corresponding to (a) Ag/SBA-15 (Y), (R) and (B); (b) Pd/Ag/SBA-15 (Y), (R) and (B).

**Table S1.** Textural properties of prepared catalysts

Catalyst	Pore volume ( $\text{cm}^3\text{g}^{-1}$ )	BET surface area ( $\text{m}^2\text{g}^{-1}$ )
SBA-15	0.653	735
Ag(1.0)/SBA-15	0.585	679

Pd(0.1)/Ag(1.0)/SBA-15	0.562	606
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**Figure S3.** (a) Low-angle, and (b) high-angle XRD patterns of SBA-15, Ag/SBA-15 (B) and Pd/Ag/SBA-15 (B).

**Table S2.** Reaction rate and % enhancement upon light irradiation for prepared catalysts.

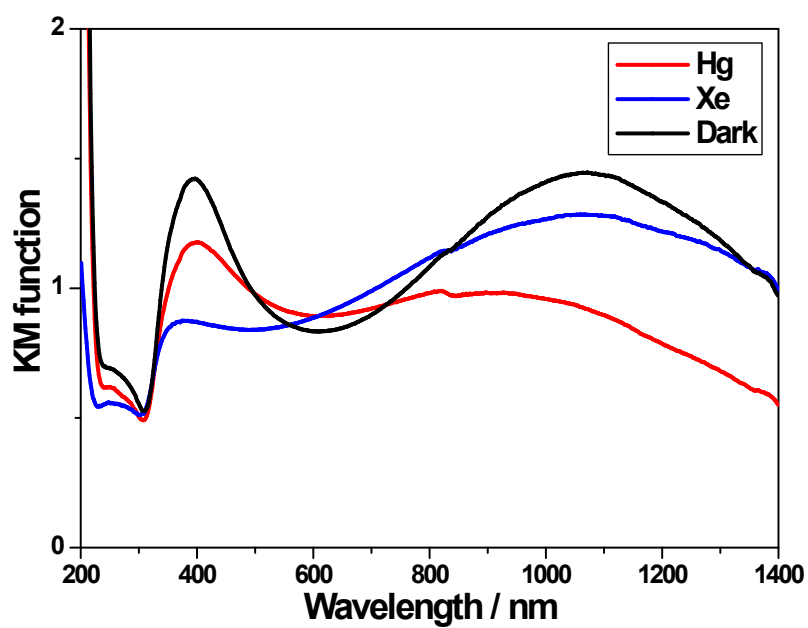
Catalyst	Reaction rate in dark (mol% min <sup>-1</sup> )	Reaction rate in light, (mol% min <sup>-1</sup> )	Rate enhancement in light (mol %)
1) Ag/SBA-15 (Y)	0.94	1.60	15
2)Pd/Ag/SBA-15 (Y)	3.22	4.64	19.5
3)Ag/SBA-15 (R)	0.39	1.24	17
4)Pd/Ag/SBA-15 (R)	2.38	4.06	28.2
5)Ag/SBA-15 (B)	0.22	1.13	20
6)Pd/Ag/SBA-15 (B)	1.24	3.80	40.8

**Table S3.** Turn over number (TON) and turn over frequency (TOF) calculated for AB dehydrogenation reaction at 20 min reaction time.

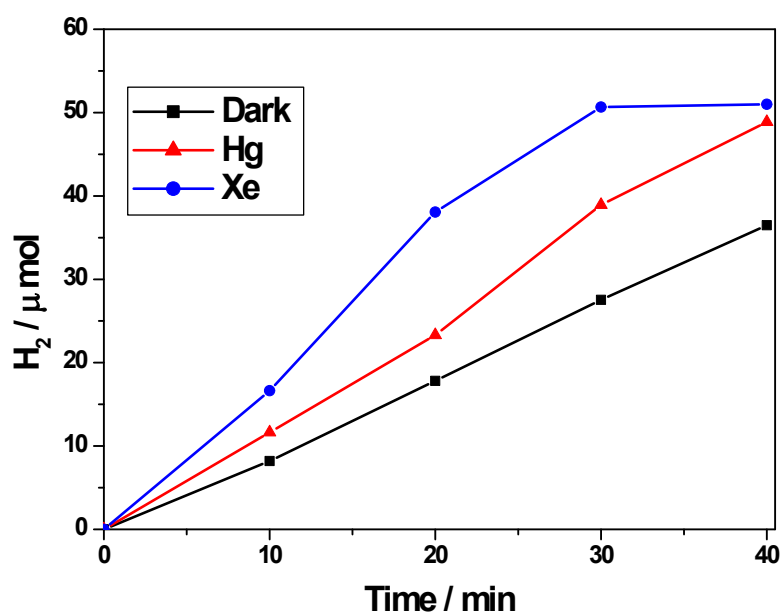
Catalyst	TON dark	TOF dark (min <sup>-1</sup> )	TON light	TOF light (min <sup>-1</sup> )
Pd/Ag/SBA-15 (Y)	1043	52	1355	68
Pd/Ag/SBA-15 (R)	817	41	1268	63
Pd/Ag/SBA-15 (B)	494	25	1147	57

**Table S4.** Turn over number (TON) and turn over frequency (TOF) calculated for Suzuki Miyaura coupling reaction for a reaction period of 6 h.

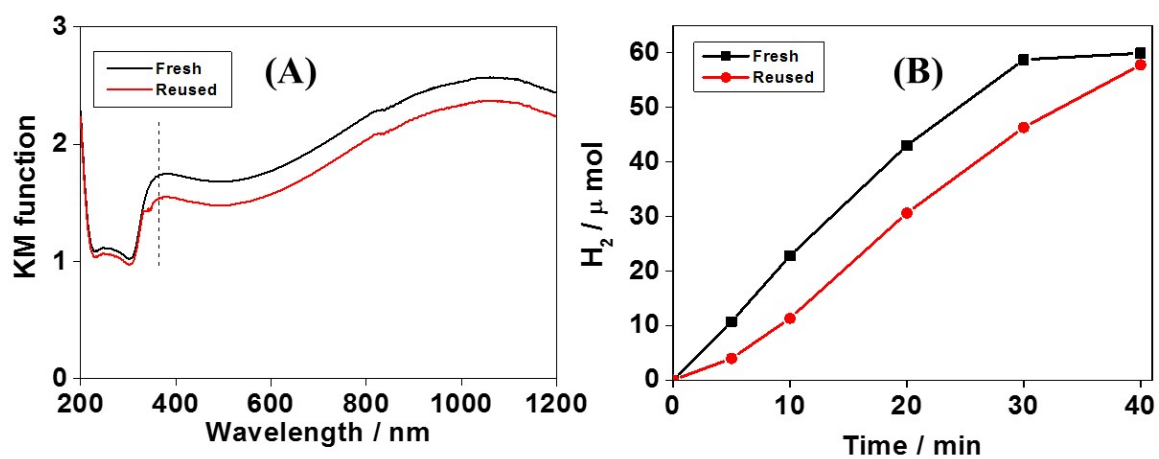
Catalyst	TON dark	TOF dark (h <sup>-1</sup> )	TON thermal	TOF thermal (h <sup>-1</sup> )	TON light	TOF light (h <sup>-1</sup> )
Pd/Ag/SBA-15 (Y)	31	5.2	800	133	1600	267
Pd/Ag/SBA-15 (R)	47	7.9	1333	222	2400	400
Pd/Ag/SBA-15 (B)	53	8.8	1866	311	2933	489



**Figure S4.** UV-Vis of Pd/Ag/SBA-15 (B) under different light sources (Xe lamp, Hg lamp and dark conditions).



**Figure S5.** Time course of hydrogen production in the AB dehydrogenation reaction over the Pd/Ag/SBA-15 (B) catalysts prepared using different light sources (Xe lamp, Hg lamp and dark conditions).



**Figure S6.** (A) UV-vis spectra and (B) catalytic activity of freshly prepared and reused Pd/Ag/SBA-15 (B) catalyst after the recycling AB dehydrogenation experiment.