Electronic Supplementary Information

A new inorganic-organic hybrid material Al-SBA-15-TPI/$H_6P_2W_{18}O_{62}$ catalyzed one-pot, three-component synthesis of 2H-Indazolo[2,1-b]phthalazine-triones

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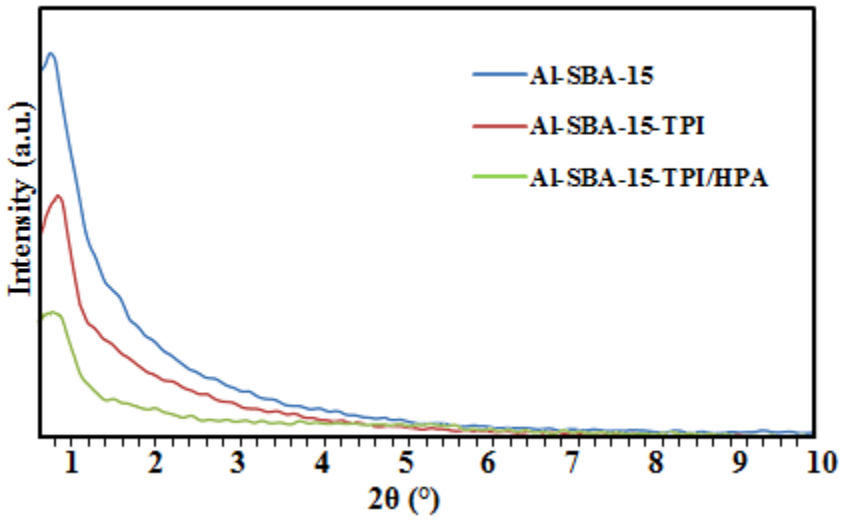

(a)

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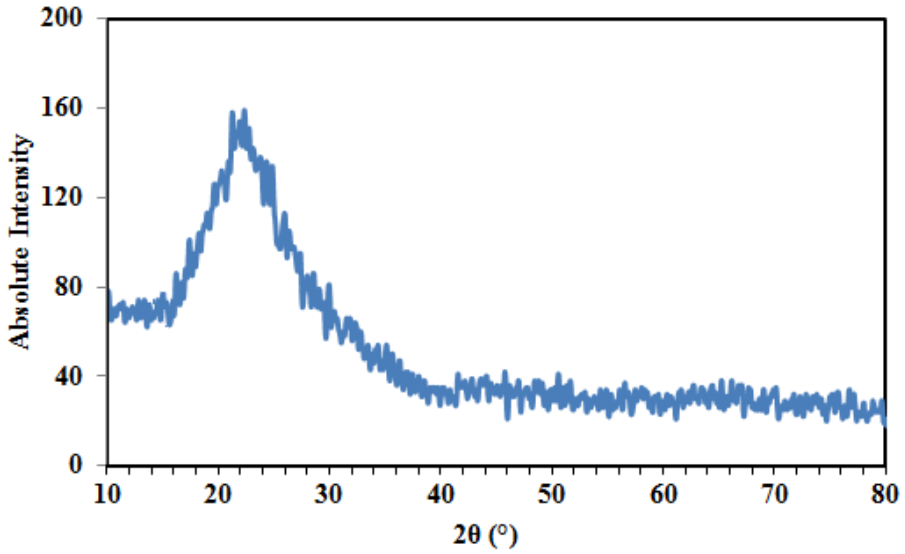

(b)

Fig. S1 (a) Low angle patterns of Al-SBA-15, Al-SBA-15-TPI and Al-SBA-15-TPI/HPA. (b) High angle XRD pattern of $H_6P_2W_{18}O_{62}$ anchored on Al-SBA-15-TPI.

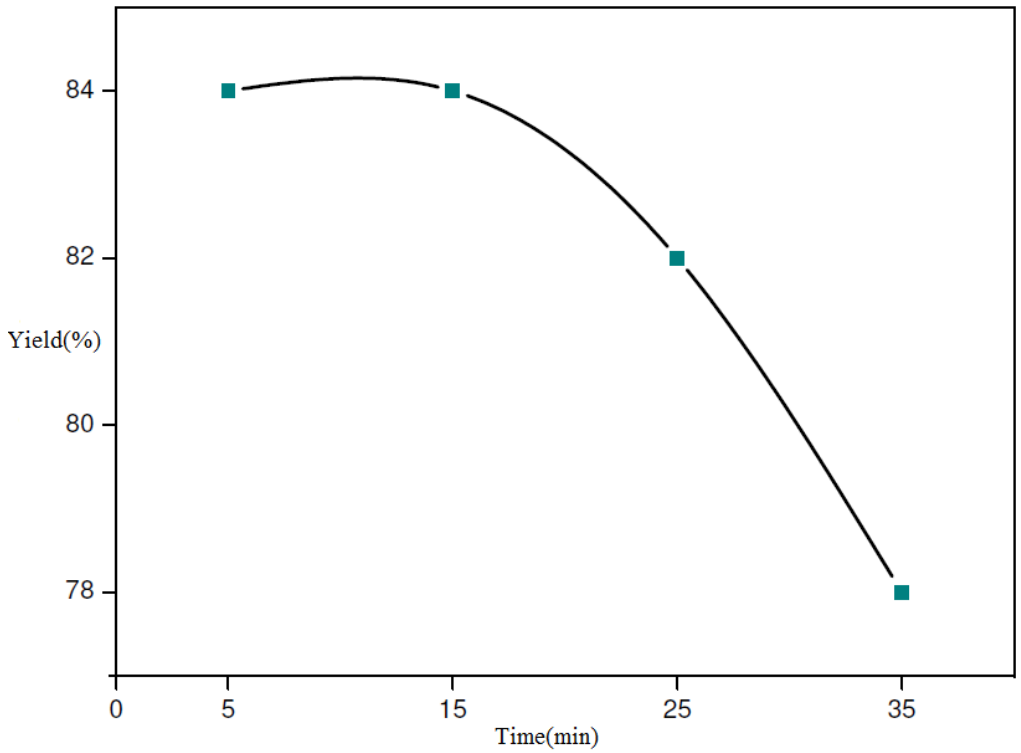

Fig. S2 Effect of the reaction time on the condensation of phthalhydrazide, benzaldehyde, and dimedone catalyzed by $H_6P_2W_{18}O_{62}$ under solvent free conditions.

Synthesis of Al-SBA-15

Incorporation of aluminium (15 mol%) to the siliceous framework of SBA-15 was performed in situ during the synthesis process as described in the supporting information. Mesoporous Al-SBA-15 was synthesized by using triblock poly(ethyleneoxide)-poly (propyleneoxide)-poly(ethylene oxide) copolymer (pluronics P123) as the structure directing agent, tetraethyl orthosilicate (TEOS) as a silica source, and aluminium tri-*sec*-butoxide as the aluminium source. In a typical process, 12.0 g of P123 was dissolved completely in 275 g of deionized water until a transparent solution obtained. Concentrated HCl (60 ml) was added to the solution while stirring. Then, 27.5 g TEOS was mixed in 100 g of deionized water and was added drop wise to the above solution. After aging the solution at 40 °C for 10 min, calculated amount of aluminium tri-*sec*-butoxide was introduced into the mixture in order to obtain an Al/Si mole ratio of 0.15. Finally, the resulting mixture was stirred for 2 h in the same temperature and then transferred to a

teflon-sealed autoclave and heated to 100 °C for 48 h. The resultant precipitate was filtered, washed, neutralized, and dried at room temperature overnight. To remove surfactant, the solid was heated from room temperature to 540 °C with the rate of 3 °C/min and then was kept at 540 °C for 6 h. The synthesis of Al-SBA-15 was confirmed by FT-IR and low-angle X-ray powder diffraction.

Synthesis of pyridine-functionalized Al-SBA-15-TPI

N-(3-(triethoxysilyl)propyl)isonicotinamide (TPI) was synthesized according to the previously reported procedure[1] and characterized by ^{1}HNMR. The synthesized Al-SBA-15 mesopore was functionalized with TPI, similar to the general procedure for functionalization[2] In a typical reaction, 1.0 g of Al-SBA-15 was suspended in 50 ml of toluene, and the mixture was stirred for 1 h. Then, 3.0 g of TPI was added and the mixture was refluxed for 24 h. The white-brown solid was removed from the solvent by filtration, washed with toluene and acetone, and dried at room temperature. The pyridine-functionalized material, Al-SBA-15-TPI, was characterized by FT-IR spectroscopy, X-ray diffraction, thermal (TGA/DTA), and elemental (CNH) analysis. Elemental analysis found for pyridine functionalized Al-SBA-15: N, 3.18; C, 14.12; S, 0.0; H, 2.28%. Elemental and thermal analyses of Al-SBA-15-TPI sample gave pyridine concentration 1.14 mmol/g.

1 J. Hoogboom, P. M. L. Garcia, M. B. Otten, J. A. A. W. Elemans, J. Sly, S. V. Lazarenko, T. Rasing, A. E. Rowan and R. J. M. Nolte, *J. Am. Chem. Soc*., 2005, **127**, 11047.

2 M. Pirouzmand, M. M. Amini and N. Safari, *J. Colloid Interface Sci*., 2008, **319**, 199.