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Electronic Supplementary Information

Hierarchical flowerlike magnesium oxide hollow spheres with extremely high surface area for adsorption and catalysis

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Experimental Section

Materials**:** Acetic acid (glacial, 99.9985%, metals basis), benzaldehyde (99+%), acetophenone (99%), 4-chlorobenzaldehyde (98%), 4-cyanobenzaldehyde (98+%), 4-methoxybenzaldehyde (98%), 2'-chloroacetophenone (98%), 2-acetylthiophene (99%) and diethylene glycol (99%) were provided by Alfa-Aesar. 4'-Fluoroacetophenone (99%) was produced by J&K scientific Co., Ltd. Triethylene glycol (99%) was produced by Sigma-Aldrich. $Mg(OAc)_2 \cdot 4H_2O$ (A.R.), $Mg(NO_3)_2 \cdot 6H_2O$ (A.R.), K_2CO_3 (A.R.), polyvinylpyrrolidone (PVP K-30, G.R.), ammonium hydroxide (25%) and ethylene glycol (A.R.) were produced by Beijing Chemical Reagent Company. Chalcone (97%) was purchased from Acros. All chemicals were used as received without any further purification. Water used in all experiments was deionized.

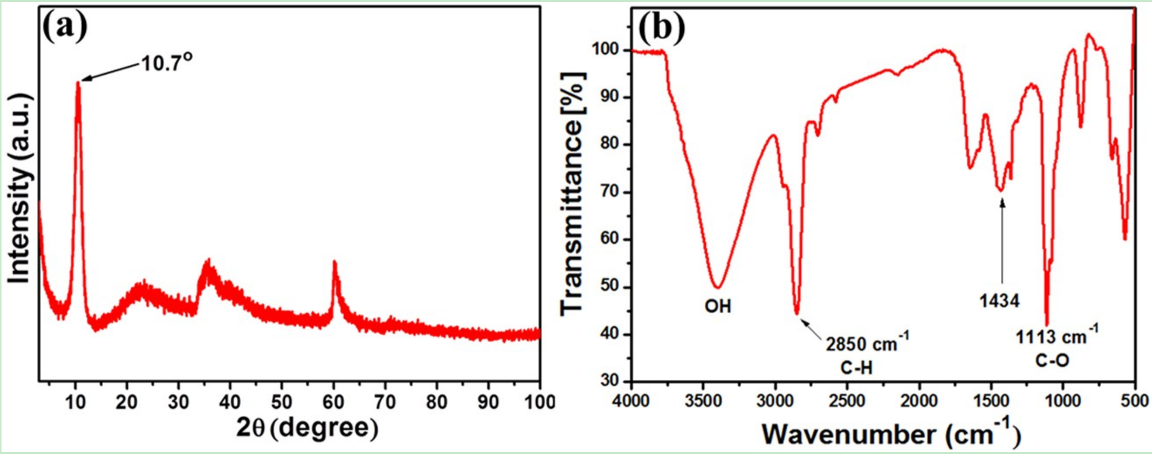

Fig. S1 XRD pattern (a) and FT-IR spectrum (b) of the synthesized magnesium glycolates.

Fig. S2 Digital photo of the as-prepared magnesium glycolates calcined under argon atmosphere at 500 ^{o}C.

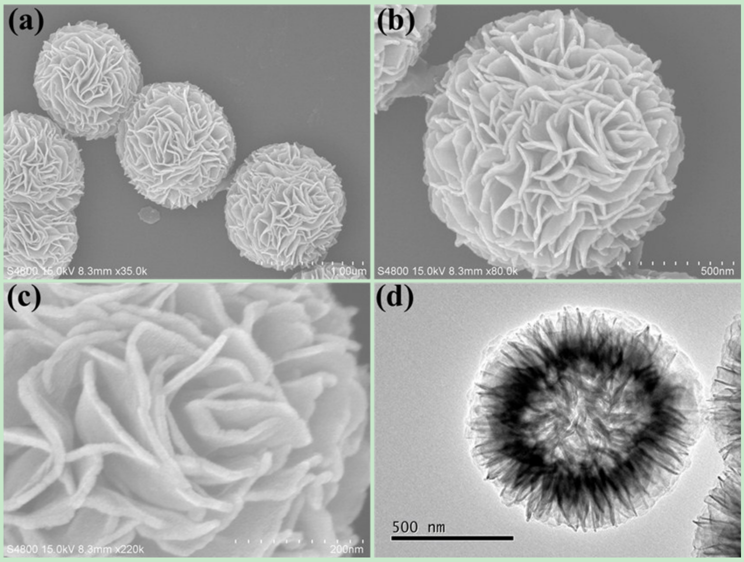

Fig. S3 SEM (a-c) and TEM (d) images of the magnesium precursors prepared at 180 ^{o}C for 24 h.

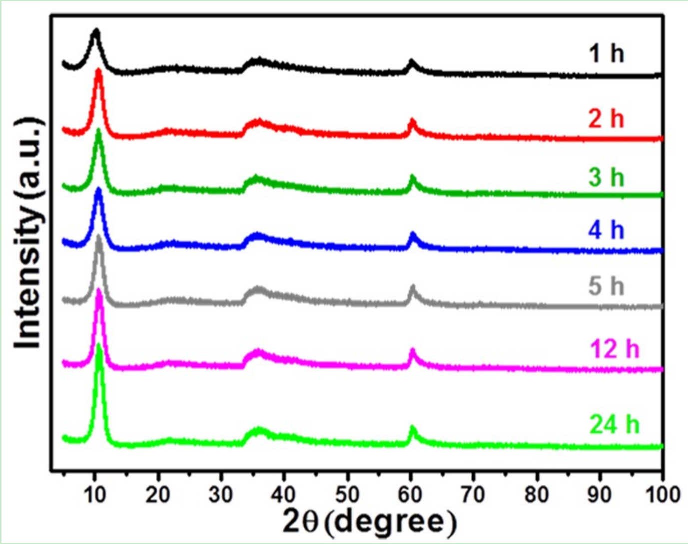

Fig. S4 XRD patterns of the obtained Mg(II)-glycol precursors with different solvothermal time.

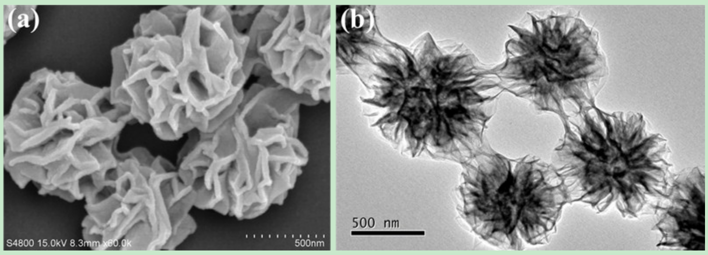

Fig. S5 SEM (a) and TEM (b) images of the magnesium glycolates prepared at 140 ^{o}C for 5 h.

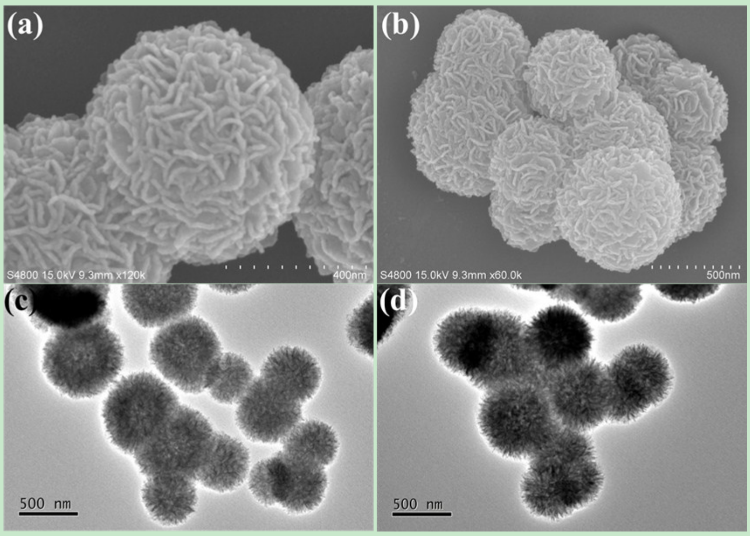

Fig. S6 SEM (a-b) and TEM (c-d) images of the prepared magnesium glycolates without usage of ammonium hydroxide.

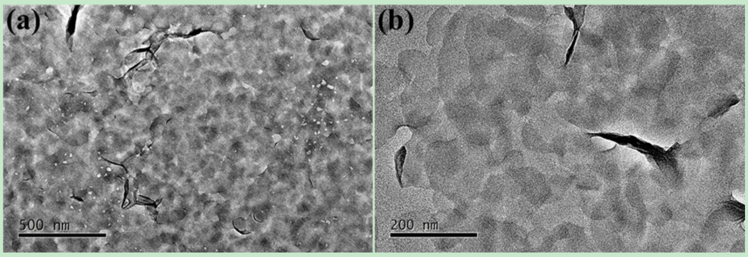

Fig. S7 TEM images (a-b) of the prepared magnesium hydrate using 500 μL 25 wt% ammonium hydroxide.

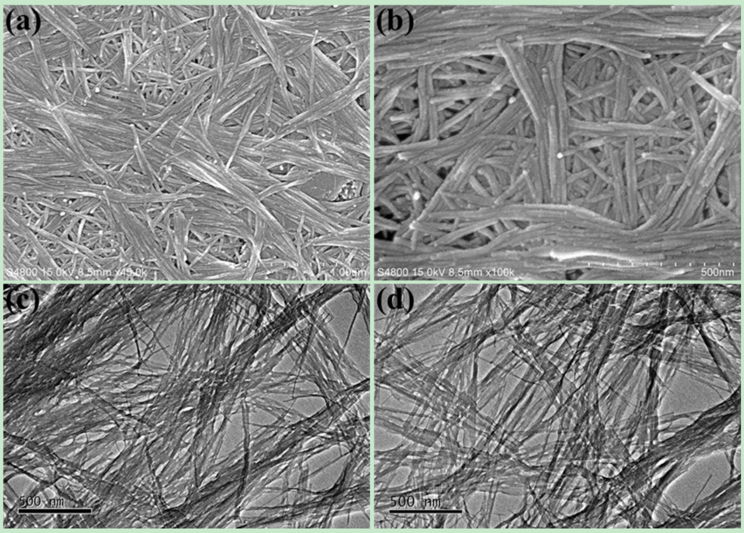

Fig. S8 SEM (a-b) and TEM (c-d) images of the prepared magnesium precursors using K_2CO_3 (1.8 mmol) as base to replace the original ammonium hydroxide.

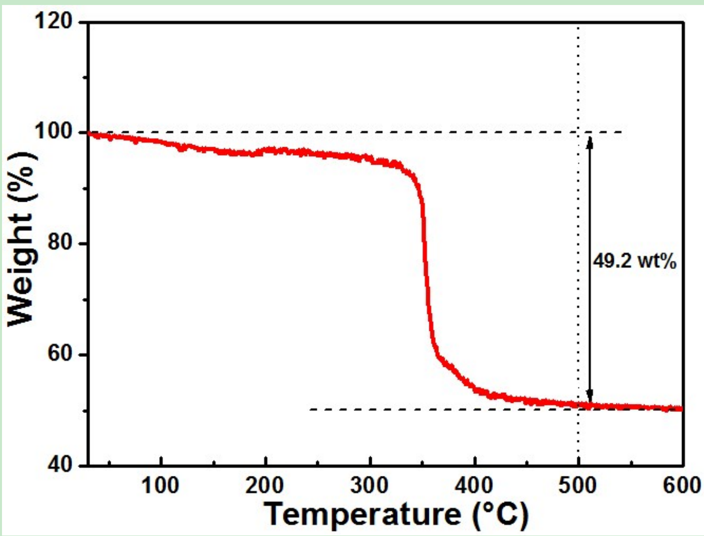

Fig. S9 TG analysis of the as-prepared magnesium glycolates calcined under air atmosphere with a heating rate of 10 ^{o}C/min.

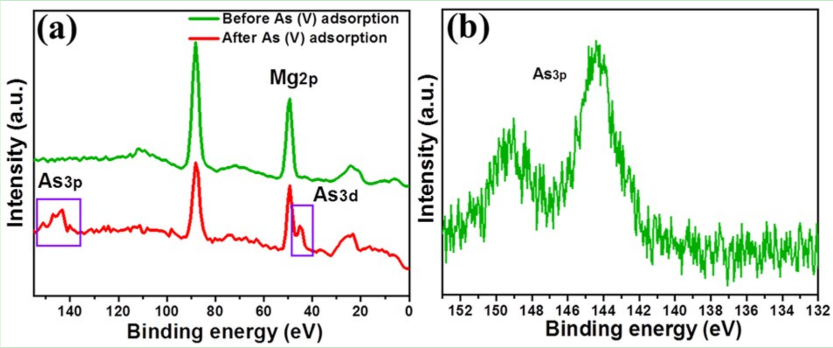

Fig. S10 XPS spectra of the flowerlike magnesium oxide hollow spheres after arsenic absorption.

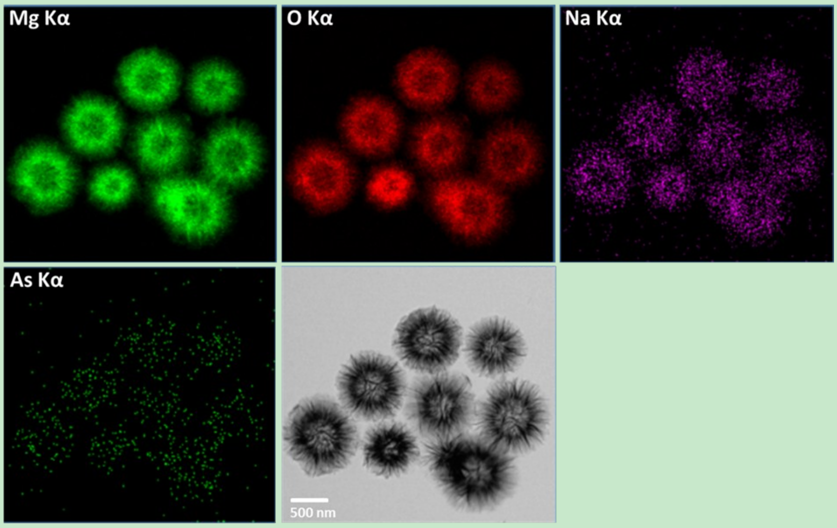

Fig. S11 Compositional EDS mapping of the flowerlike magnesium oxide hollow spheres using STEM after As (V) absorption.

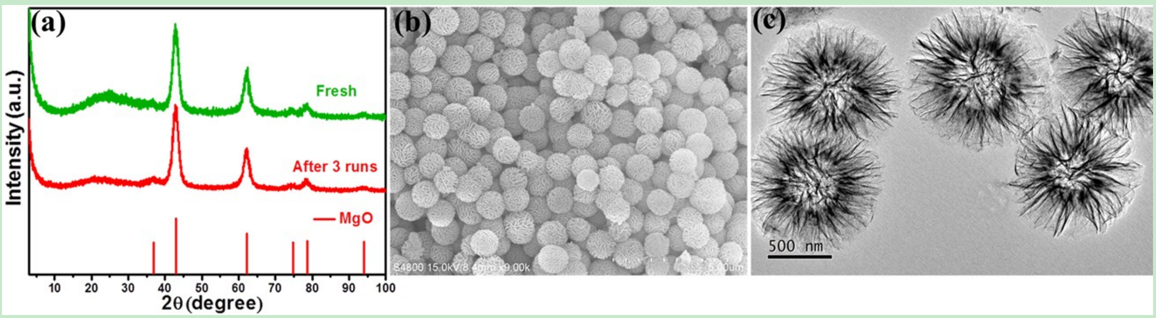

Fig. S12 XRD patterns (a), SEM (b) and TEM (c) images of the fresh flowerlike magnesium oxide hollow spheres and flowerlike magnesium oxide hollow spheres after 3 runs in Claisen-Schmidt condensation reaction.

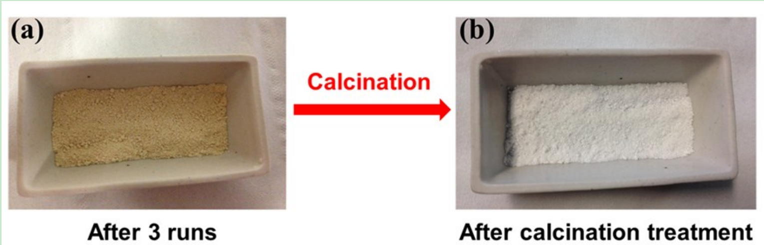

Fig. S13 Digital photo of the flowerlike magnesium oxide hollow spheres after 3 runs in Claisen-Schmidt condensation reaction (a) and after calcination treatment (b).

Table S1 Maximum adsorption properties of hierarchical flowerlike magnesium oxide hollow spheres and other related nanomaterials.

Adsorbents	**Maximum adsorption Capacity for As (V) [mg g^{-1}]**	**References**
Hierarchical Flowerlike Magnesium Oxide Hollow Spheres	569.7 mg g^{-1}	**This work**
Flowerlike Iron Oxide	7.6 mg g^{-1}	*Adv. Mater.*, **2006**, *18*, 2426-2431
Zeolitic Imidazolate Framework-8 (ZIF-8)	76.5 mg g^{-1}	*J. Phys. Chem. C*, 2014, **118** , 27382-27387
Graphene–α-FeOOH Aerogel	81.3 mg g^{-1}	*ACS Appl. Mater. Interfaces*, 2015, **7**, 9758-9766
Nanoporous MgO Nanowires	384.6 mg g^{-1}	*RSC Adv.*, 2013, **3**, 5430-5437
Magnetic Iron Oxide/Graphene Oxide	26.76 mg g^{-1}	*Phys. Chem. Chem. Phys.*, 2015, **17**, 4388-4397
Micro-/Nanostructured MgO	378.79 mg g^{-1}	*J. Phys. Chem. C*, 2011, **115**, 22242-22250
Ceria hollow nanospheres	22.4 mg g^{-1}	*J. Phys. Chem. C*, 2010, **114**, 9865-9870
MgAl layered double hydroxides	125.8 mg g^{-1}	*RSC Adv.*, 2015, **5**, 10412-10417
Basic aluminum carbonate porous nanospheres	170 mg g^{-1}	*J. Mater. Chem.*, 2012, **22**, 19898-19903
Flowerlike α-Fe_2O_3 Nanostructures	51 mg g^{-1}	*Langmuir*, 2012, **28**, 4573-4579
Magnetite-graphene-layered double hydroxides (LDHs)	73.14 mg g^{-1}	*J. Mater. Chem.*, 2011, **21**, 17353-17359
Layered double Hydroxides/graphene oxide (LDHs/GO)	183.11 mg g^{-1}	*ACS Appl. Mater. Interfaces*, 2013, **5**, 3304-3311