Supplementary information

An excellent sensible heat storage and photothermal conversion pyrite waste material for pollutant removal

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Text S1

Materials. All the chemical reagents employed in this investigation are of analytical grade and without further purification before use. Nitric acid (HNO_3), hydrochloric acid (HCl), and OFX were commercially available from Shanghai Maclean Biochemical Technology Co., Ltd. Ethanol and hydrogen peroxide (H_2O_2, 35%) were supplied by Shanghai Aladdin Biochemical Technology Co., Ltd. Methylene blue (MB), methyl orange (MO), rhodamine B (RhB), tetracycline hydrochloride (TC), norfloxacin (NOR) and metronidazole (MNZ) were purchased from Sinopharm chemical reagent Co., Ltd. The natural pyrite waste was derived from mine waste in Baihe of Shaanxi, China.

Text S2

Characterization. The crystal structure of the material was examined on the X-ray diffractometer (D8 ADVANCE) operated under a voltage of 40 kV and a current of 40 mA by using the Cu Kα radiation over an angular range of 5–80° (2θ). in the 2θ scan range of 5-80°. The Fourier transform infrared spectroscopy (FTIR PerkinElmer Spectrum Two) was employed to ascertain the functional groups of material in the form of KBr discs over the range of 400 to 4000 cm^{-1}. The morphologies of the material were observed by field emission scanning electron microscopy (SEM, Tescan Mira4). The X-ray spectrometer (EDX, Xplore30. Aztec one) was applied in conjunction with SEM to perform element analysis of the material. The optically absorbing property of the material was characterized by ultraviolet–visible near-infrared (UV–Vis-NIR) spectrophotometer (Agilent Cary 5000). The thermal stability of the material was examined on thermogravimetric analyze (TGA, STA449c/3/GA , Netzsch Inc., Germany) t from room temperature to 1000 °C at a heat ingrate of 20 °C/min under nitrogen airflow of 80 mL/min. The thermal conductivity of the material was measured by the Hotdisk transient flat plate heat source method. The differential scanning calorimetry DSC (DSC-60PLUS) was applied to determine the specific heat capacity of the material. The measure was performed under the heating rate of 10 °C/min and nitrogen flow rate of 50 mL/min, and the DSC curve of empty crucible and sapphire with known specific heat capacity were recorded as a baseline and standard calibration, respectively. Finally, the specific heat capacity of the material was calculated according to Eq. (1).

$$c_{p,\ sample} = \frac{c_{p,\ sapphire} \cdot m_{sapphire}}{m_{sample}} \times \frac{DSC_{sample} - DSC_{baseline}}{DSC_{sapphire} - DSC_{baseline}} \#(1)$$

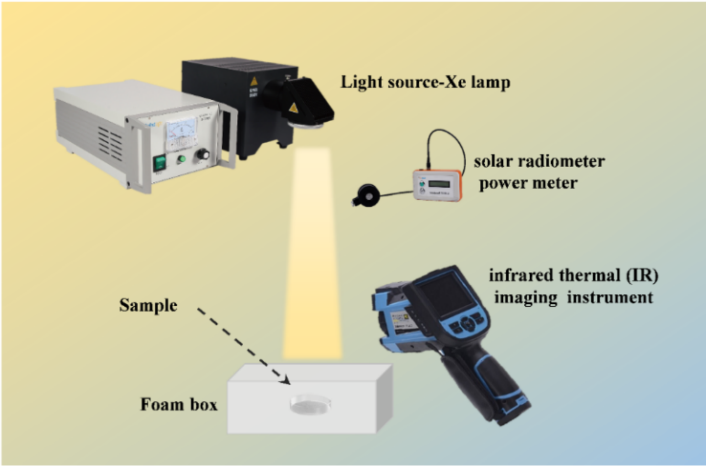

Fig. S1. The photothermal conversion test system

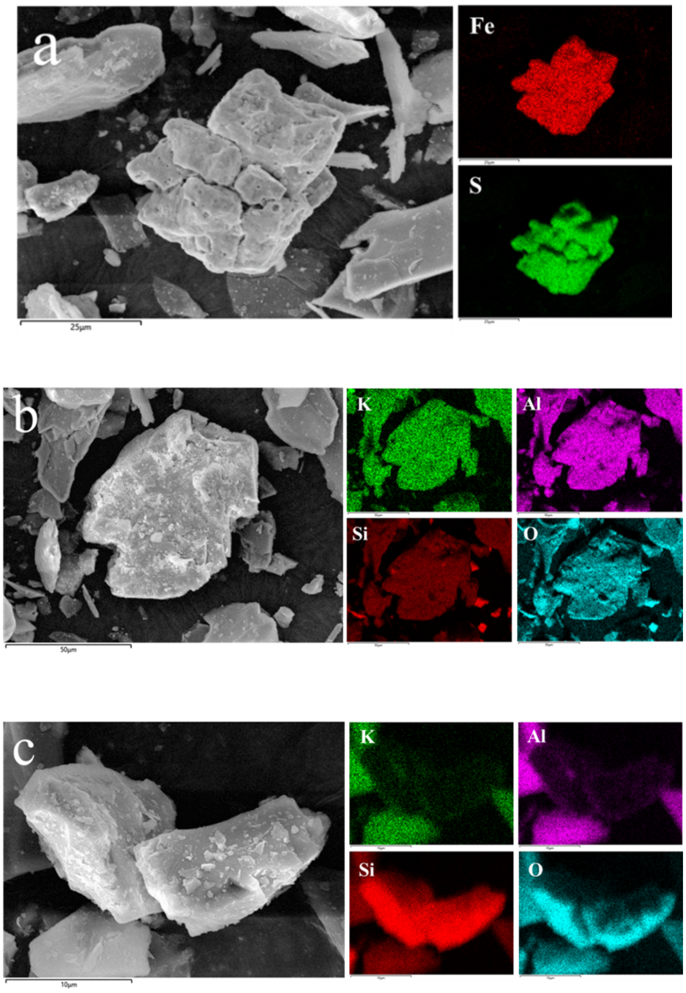

Fig. S2. SEM and corresponding EDS mapping of (a) pyrite, (b) muscovite, (c) quartz in pyrite waste

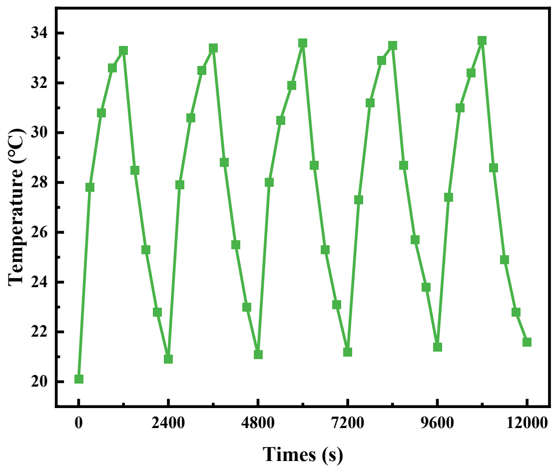

Fig. S3. The temperature change of pyrite waste solution under ON/OFF irradiation.

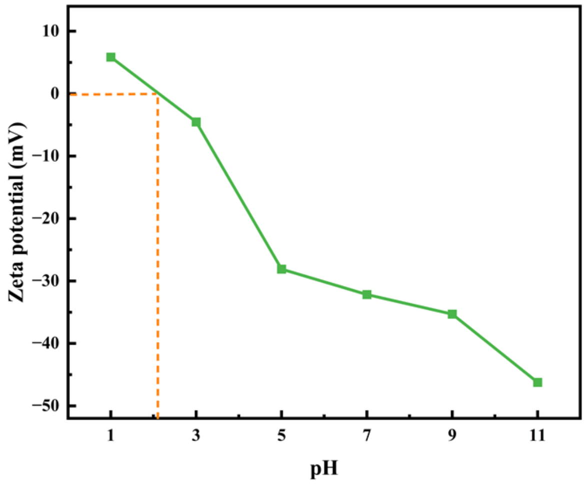

Fig.S4 The zeta potential of pyrite waste under different pH