Electronic Supplementary Material (ESI) for Dalton Transactions.

Supporting information

Synthesis of novel Au@Void@Nb_2O_5 core-shell nanocomposites with enhanced photocatalytic activity

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The preparation of Au@Nb_2O_5-300 °C:

The as-prepared Au nanoparticles (5 mL) dissolved with a mixed solution of 0.1 g hydroxypropyl cellulose (HPC), 20 mL ethanol and 0.15 mL deionized water was tirring for 1 h. Then niobium (V) ethanol (0.6 mL) dissolved in 5 mL ethanol was injected into the mixed solution slowly within 20 min, followed by refluxing at 90 °C for 100 min. The precipitate formed was isolated by centrifugation and washed by absolute ethanol. The above coating procedure was repeated again to increase the thickness of the Nb_2O_5 shell. The obtained powder was dried in vacuum oven for 4 h and then calcined in air at 300 °C for 2h.

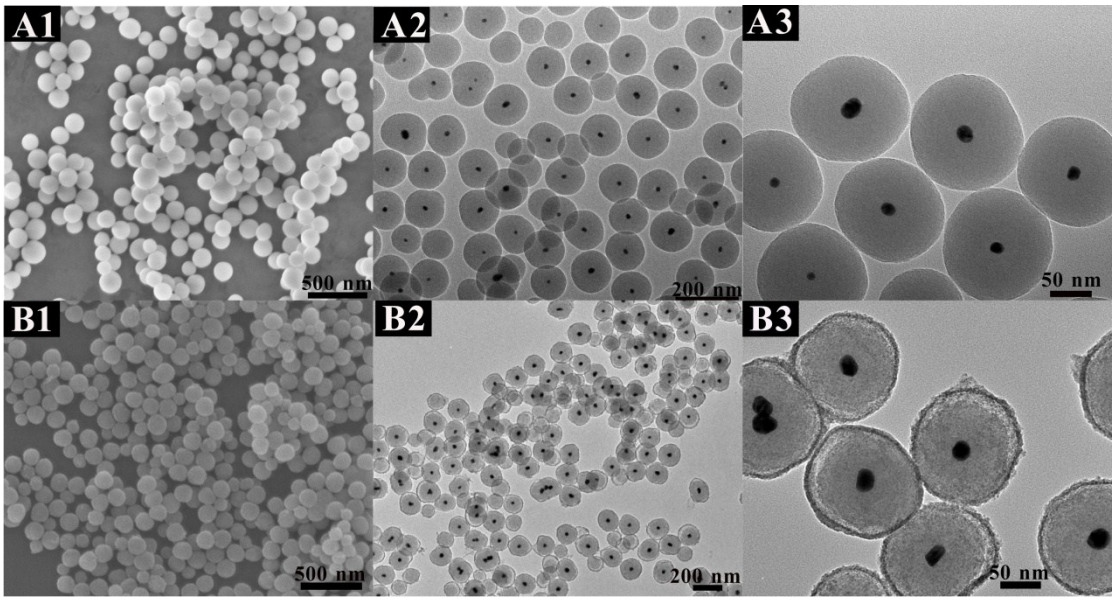

Fig. S1. A1, A2 and A3 are the SEM, TEM, HTEM images of the sample Au@SiO_2; B1, B2 and B3 are the SEM, TEM, HTEM images of Au@Void@Nb_2O_5-2 (etching at base solution for 1.5 h and then being calcined at 300 °C for 2 h).

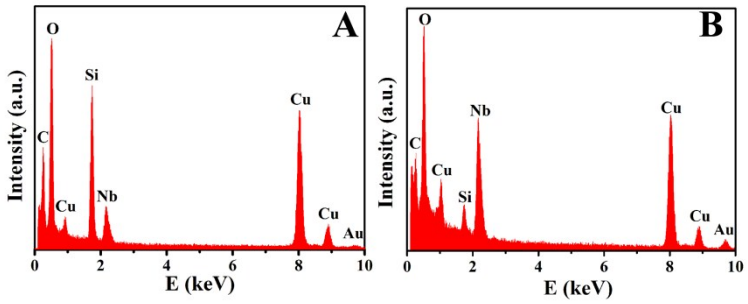

Fig. S2. A: EDX spectra of Au@SiO_2@Nb_2O_5-2-300 ^{0}C; and B: Au@Void@$Nb_2O_5Nb_2O_5$-2-300 ^{0}C respectively.

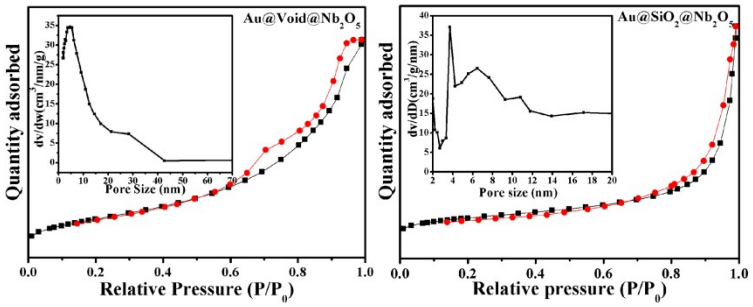

Fig. S3 N_2 adsorption and desorption isotherms of the Au@Void@Nb_2O_5-2(left) and Au@SiO_2@Nb_2O_5-2(right) nanospheres at calcination temperature of 300 ^{o}C (insert is the plot of pore size distribution).

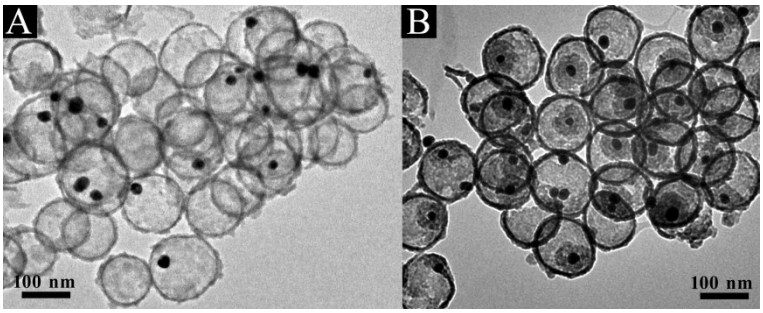

Fig. S4 TEM images of Au@Void@Nb_2O_5 catalysts of different thicknesses and Au loading amounts.(A): 5.73% Au with 1 time Nb_2O_5 coating(Au@Void@Nb_2O_5-1),(B):1.71% Au with 3 times Nb_2O_5 coating(Au@Void@Nb_2O_5-3). All the samples calcined at 300 ^{o}C.

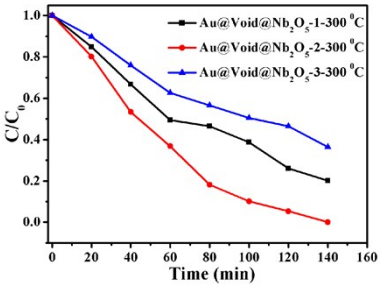

Fig. S5 Comparison of the photocatalytic efficiency over the various samples with different Au loading amounts (5.73%, 2.68%, 1.71% corresponding to the sample Au@Void@Nb_2O_5-1-300 °C, Au@Void@Nb_2O_5-2-300 °C, Au@Void@Nb_2O_5-3-300 °C) by photodegradation of aqueous Rh B solution.

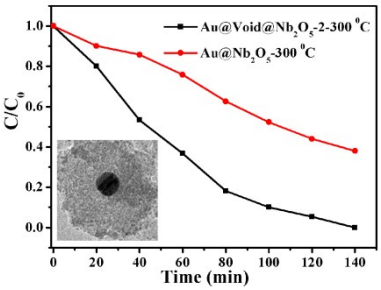

Fig. S6 The comparison of the photocatalytic performance of the two catalysts Au@Void@Nb_2O_5 -2-300 °C and Au@Nb_2O_5-300 °C by photodegradation of aqueous Rh B solution under visible light irradiation, insert is the HTEM images of the Au@Nb_2O_5.

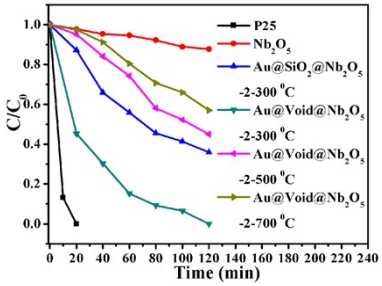

Fig. S7 Photacatalytic activity of various catalysts toward degradation of aqueous RhB solution under UV light irradiation.

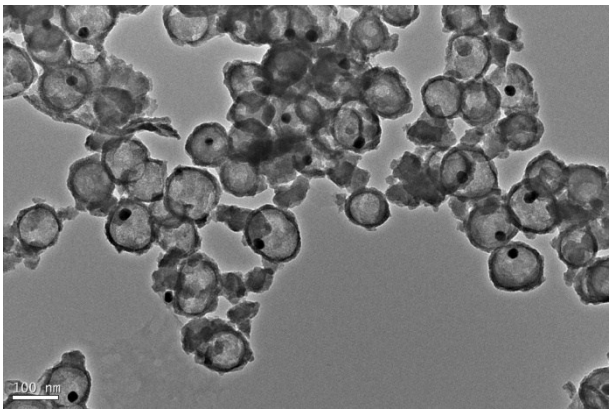

Fig. S8 TEM images of Au@Void@Nb_2O_5-2-300 ^{0}C catalysts after 5 cycles of photodegradation of aqueous Rh B solution under visible light irradiation.