

## Ultrathin Janus Nanodiscs

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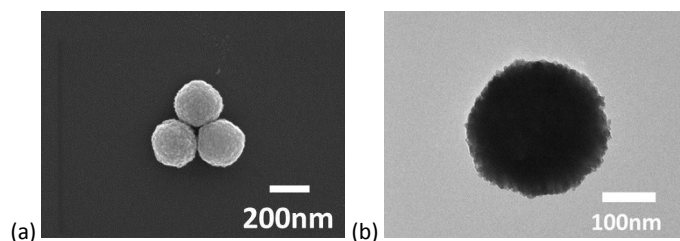


Figure S1. (a) SEM and (b) TEM images of the Fe<sub>3</sub>O<sub>4</sub> microspheres.

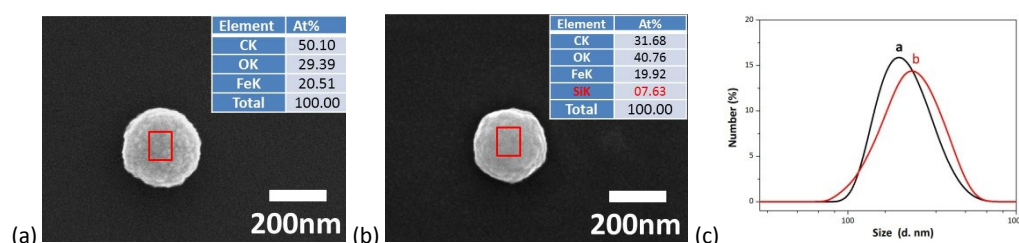


Figure S2. SEM image and inset EDX data: (a) Fe<sub>3</sub>O<sub>4</sub> microsphere; (b) Fe<sub>3</sub>O<sub>4</sub>@SiO<sub>2</sub> core/shell microsphere; (c) DLS of Fe<sub>3</sub>O<sub>4</sub> (line a) and Fe<sub>3</sub>O<sub>4</sub>@SiO<sub>2</sub> core/shell microsphere (line b).

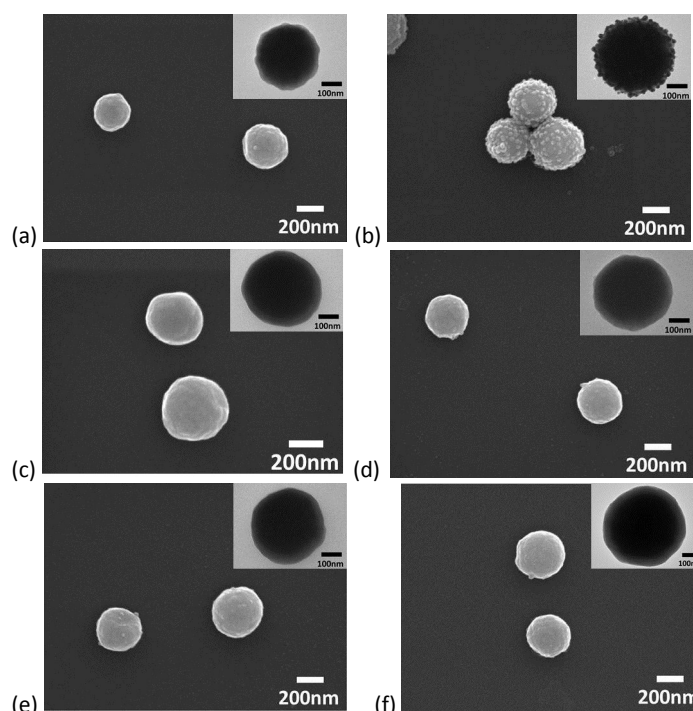
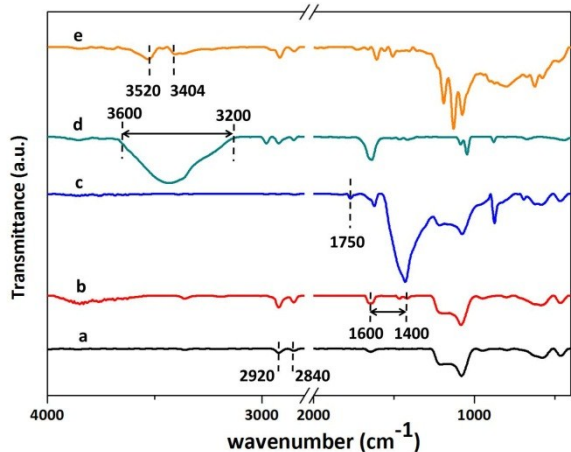
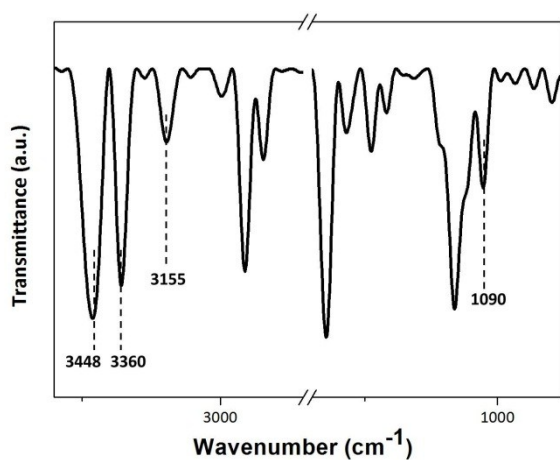


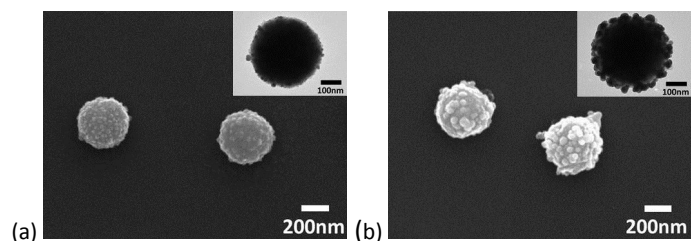
Figure S3. SEM and inset TEM images of some representative microspheres: (a) a Fe<sub>3</sub>O<sub>4</sub>@SiO<sub>2</sub> core/shell microsphere; (b) (Fe<sub>3</sub>O<sub>4</sub>@SiO<sub>2</sub>)-Ag microsphere; (c) hydrophobic C<sub>8</sub>-SiO<sub>2</sub> microsphere; (d) C<sub>8</sub>-(Fe<sub>3</sub>O<sub>4</sub>@SiO<sub>2</sub>)-PhCH<sub>2</sub>Cl microsphere; C<sub>8</sub>-(Fe<sub>3</sub>O<sub>4</sub>@SiO<sub>2</sub>)-PhCHO microsphere after absorption of APTMS before (e) and after (f) the sol-gel process forming a molecular thick layer of SiO<sub>2</sub>.



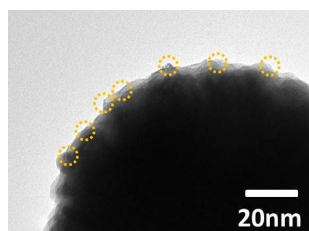
**Figure S4.** The FTIR spectrum indicates different microspheres: (a) patchy C<sub>8</sub>-(Fe<sub>3</sub>O<sub>4</sub>@SiO<sub>2</sub>) microspheres; (b) patchy C<sub>8</sub>-(Fe<sub>3</sub>O<sub>4</sub>@SiO<sub>2</sub>)-PhCH<sub>2</sub>Cl microspheres; (c) patchy C<sub>8</sub>-(Fe<sub>3</sub>O<sub>4</sub>@SiO<sub>2</sub>)-PhCHO microspheres; (d) APTMS was grafted onto the PhCHO region of patchy C<sub>8</sub>-(Fe<sub>3</sub>O<sub>4</sub>@SiO<sub>2</sub>)-PhCHO microspheres; (e) patchy C<sub>8</sub>-(Fe<sub>3</sub>O<sub>4</sub>@SiO<sub>2</sub>)-SiO<sub>2</sub> microspheres.



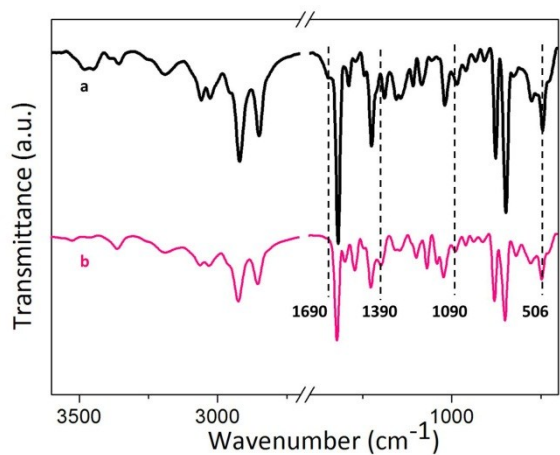
**Figure S5.** The FTIR spectrum indicates aminopropyl/hydroxyl composited Janus nanodiscs.



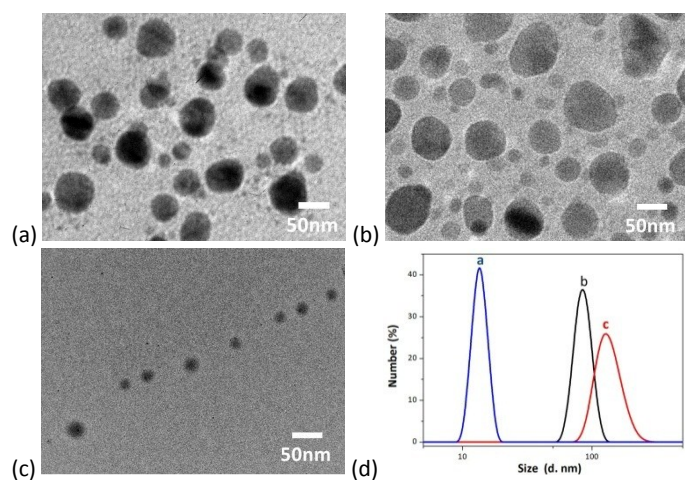
**Figure S6.** SEM and inset TEM images of the patchy (Fe<sub>3</sub>O<sub>4</sub>@SiO<sub>2</sub>)-Ag microspheres with different reaction time: (a) 40 mins; (b) 60 mins.



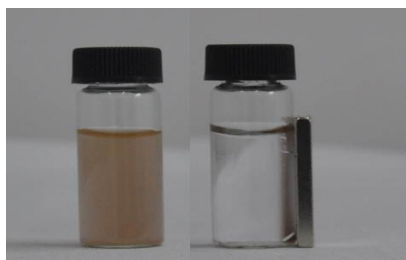
**Figure S7.** TEM image indicates onto the silica domains of the composite microsphere (as shown Fig. S3f) Fe<sub>3</sub>O<sub>4</sub> NPs-PEO is grafted.



**Figure S8.** The FTIR spectrum indicates: (a) Phenyl/ $\text{Fe}_3\text{O}_4$  NPs-PEO modified Janus composite nanodiscs; (b) benzyl/ $\text{Fe}_3\text{O}_4$  NPs-PEO composited Janus nanodiscs.



**Figure S9.** (a-c) TEM images of the as-prepared Janus nanodiscs dispersed in different solvents: water (a), cyclohexane (b) and THF (c); (d) size distribution in the different solutions (line a: THF; line b: water; line c: cyclohexane).



**Figure S10.** Magnetic response demonstration of the as-prepared Janus nanodiscs: the as-prepared Janus nanodiscs were dispersed in water (left) and it can be easily manipulated with external magnetic field (right).