Supporting Information

Near-infrared light induced fusion and fission of azobenzene-containing polymer vesicles

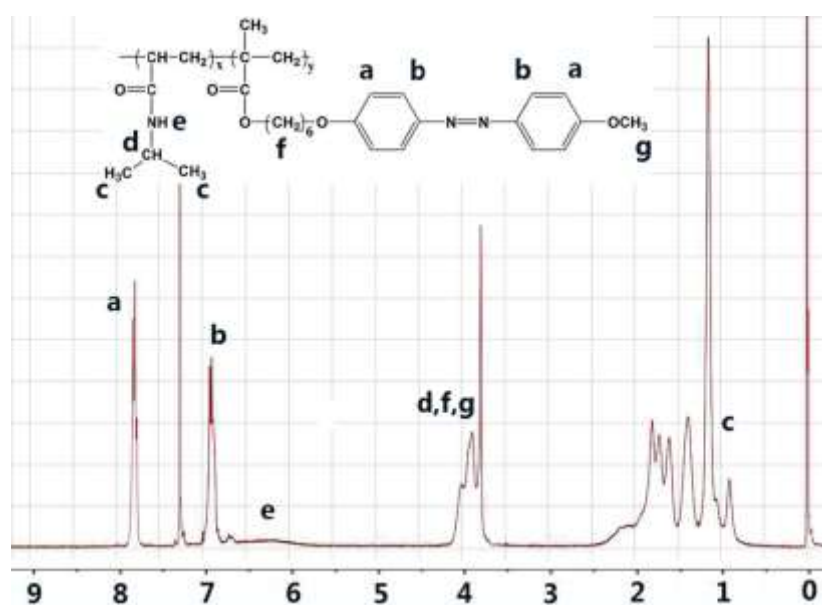Kang Sun, Kun Chen, Guosheng Xue, Jun Cai, Gang Zou, Yinmei Li, Qijin Zhang*

Fig. S1 The ^{1}H NMR spectrum of PNIPAM-b-PAZO in CDCl$_3$. [1]

The composition of the block copolymer was determined from the ratio of peak integrals around 1.1 ppm (d) and 4.0 ppm (d) of PNIPAM to the peak at approximately 7.8 ppm (a) of PAZO. The average numbers of repeat units were estimated by peak integrals, resulting in PNIPAM$_{123}$-b-PAZO$_{50}$.
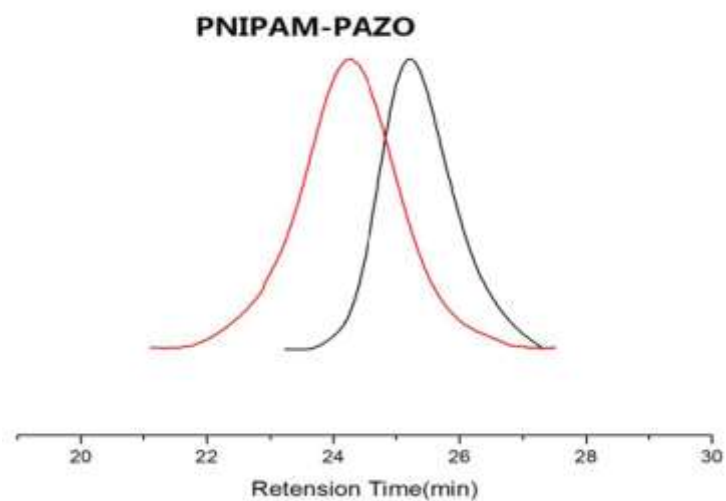
PNIPAM-PAZO

Fig. S2 GPC curves of PNIPAM macroinitiator and PNIPAM-b-PAZO copolymers. [1]

The polydispersity indexes of PNIPAM macroinitiator and PNIPAM-b-PAZO are 1.06 and 1.27, individually, given by GPC in THF using polystyrene calibration. In addition, the molecule weight of two polymers was also obtained: $\overline{M_n}$ (PNIPAM) =14153, $\overline{M_n}$(PNIPAM-b-PAZO) =34200.
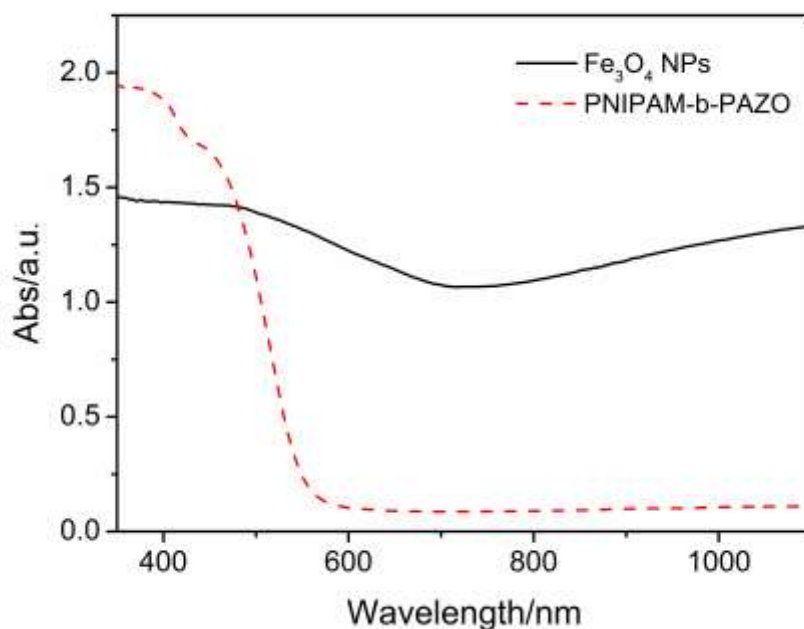

Fig. S3 Absorption spectra of Fe_3O_4 nanoparticles (solid line) and PNIPAM-b-PAZO copolymer (dash line)

Fe3O4 nanoparticles shows a broad absorption band from UV to NIR，while the absorption spectrum of PNIPAM-b-PAZO only extends to 600nm.
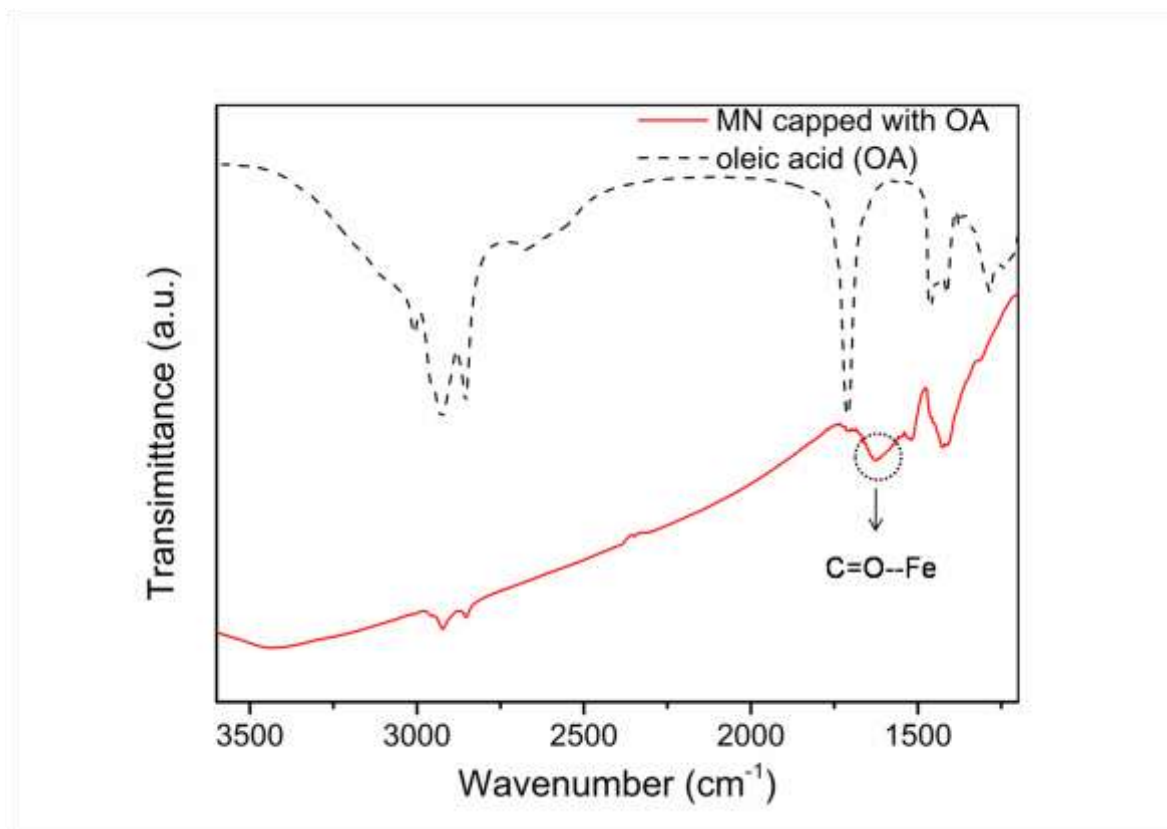
Fig. S4 IR spectra of oleic acid (black dash line) and MN capped with oleic acid (red solid line)

Fig. S5 The photo of MN capped with oleic acid dispersed in (a) water and (b) THF solvent, respectively.

We can conclude that MN can be easily dispersed in THF after capped with oleic acid, and it is hydrophobic as it cannot disperse in water.
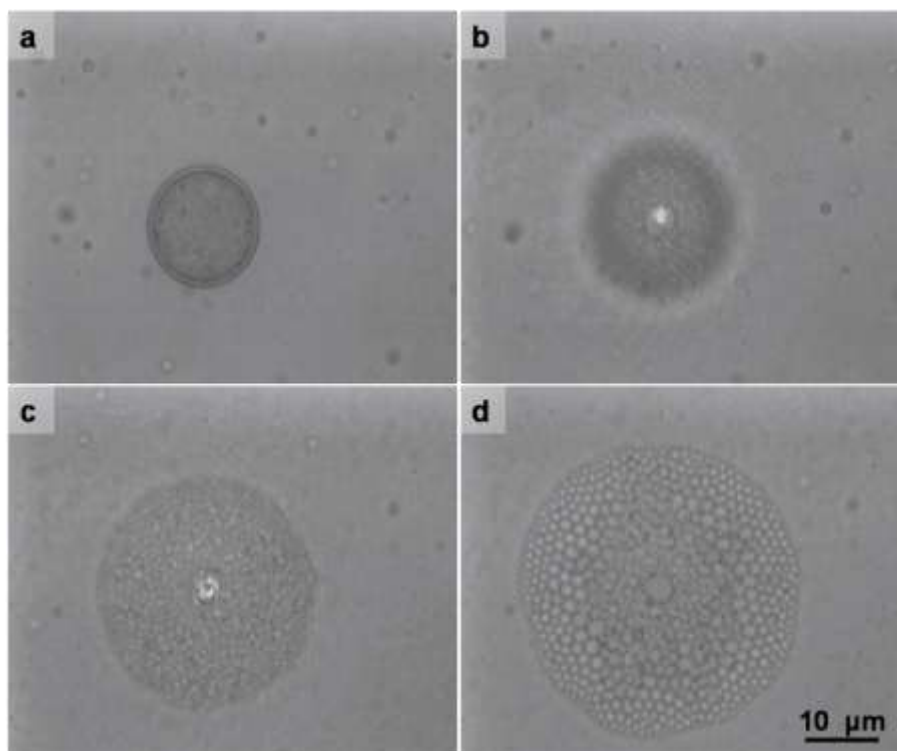
Fig. S6 Optical micrograph of vesicle doped with MN (10 wt%) under irradiation of NIR light (50 mw/μm^2). Fission process is shown in (a)-(d).
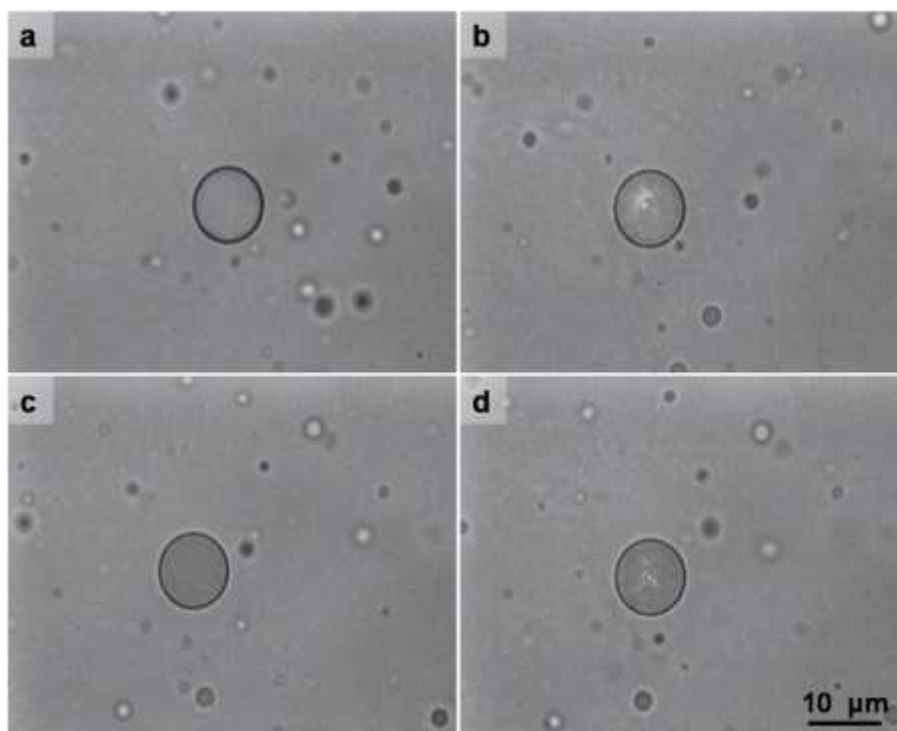

Fig. S7 Optical micrograph of the vesicle doped with MN (0.1 wt%) before (a) and after irradiation with NIR light (b), UV (c), NIR+UV (d).
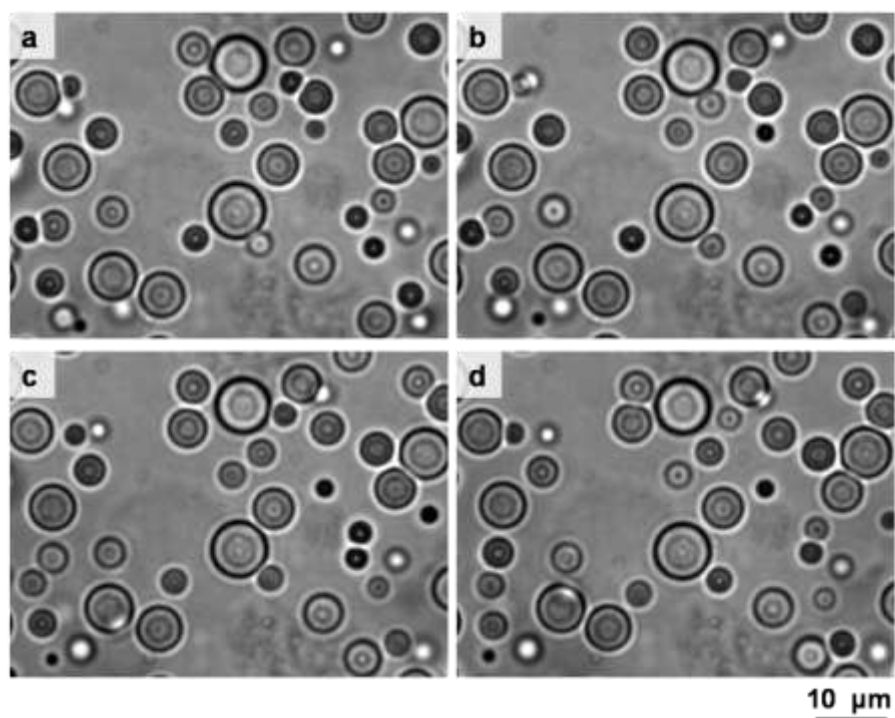
Fig. S8 Optical micrograph of vesicular solution (without the encapsulation of MN) before (a) and after irradiation of NIR light (1064nm, 120 mw/μm^2) for 10s (b), 20s (c) and 30s (d).
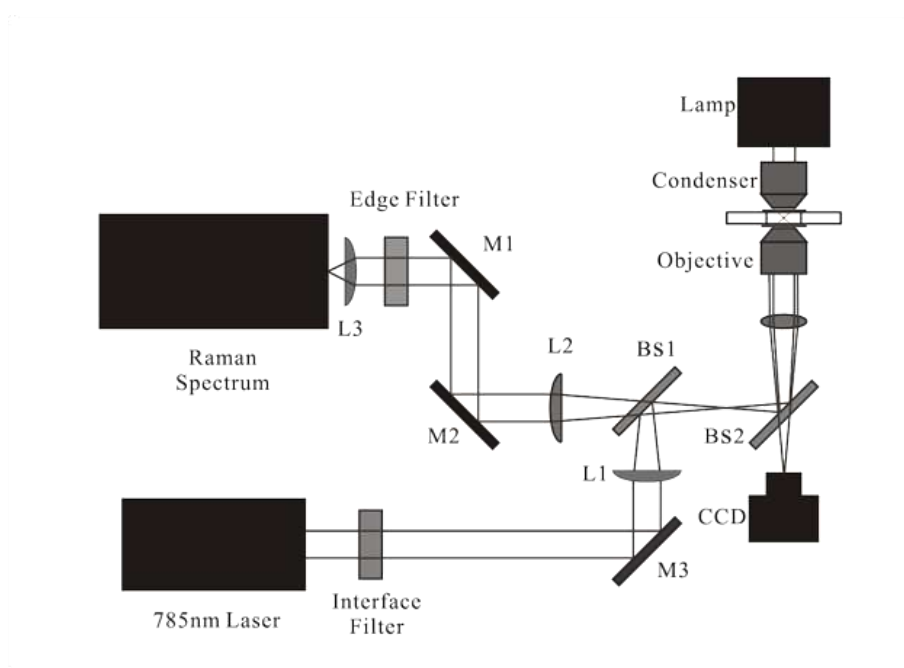

Fig. S9 Layout of the LTRS instrument   (M: Mirror, L: Lens, BS: Beam splitter)

The LTRS system composes of a microscope, a spectrometer and a continuous-wave diode-pumped solid-state laser. The 785nm laser beam from a diode laser (120mW

Crystalaser) is focused by a high NA oil-immersion objective (100×, NA1.35, OLYMPUS) to the spot in the specimen plane. With an interface filter blocks the plasma line, the beam can also be used for Raman spectrum excitation. The Raman spectrum excited from the sample which is cooled by liquid nitrogen is collected by Raman spectrum (LS785, Princeton Instrument) and saved on a computer for further analysis. Videos are taken by a CCD camera and recorded on a computer.

References

1 K. Chen, G. Xue, G. Shen, J. Cai, G. Zou, Y. Li and Q. Zhang, *RSC Adv.*, 2013, **3**, 8208.