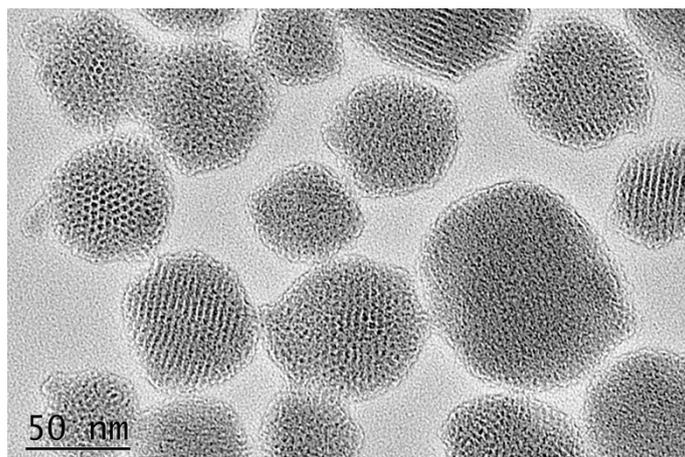


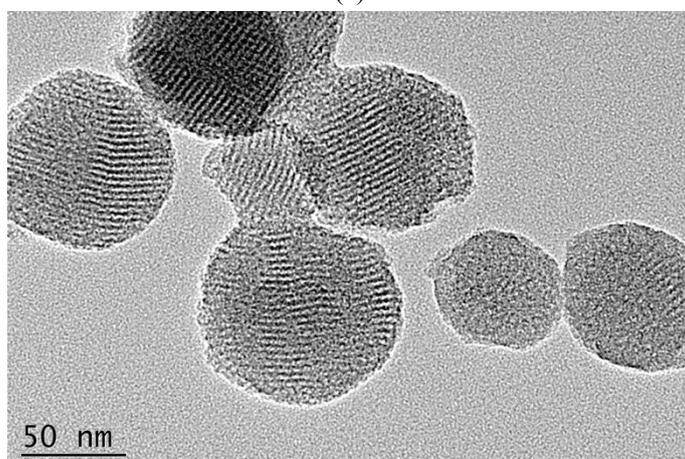
## **Supplementary Information**

### **pH Sensitive Chitosan-Mesoporous Silica Nanoparticles for Targeted Delivery of Ruthenium Complex with Enhanced Anticancer Effects**

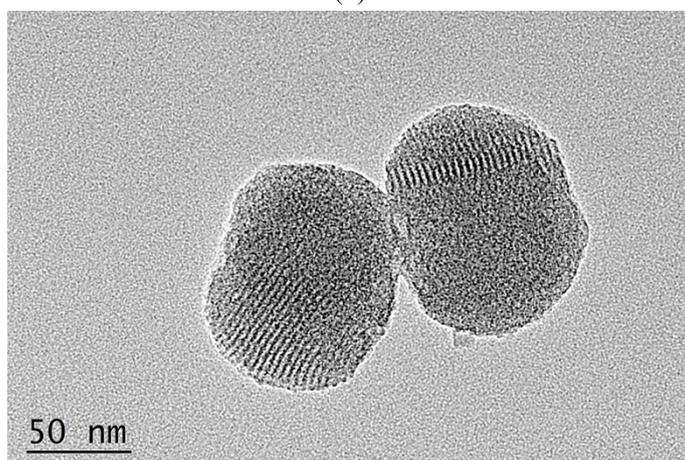
**Gaochao Lv, Ling Qiu\*, Guiqing Liu, Wei Wang, Ke Li, Xueyu Zhao and Jianguo Lin\***



(a)

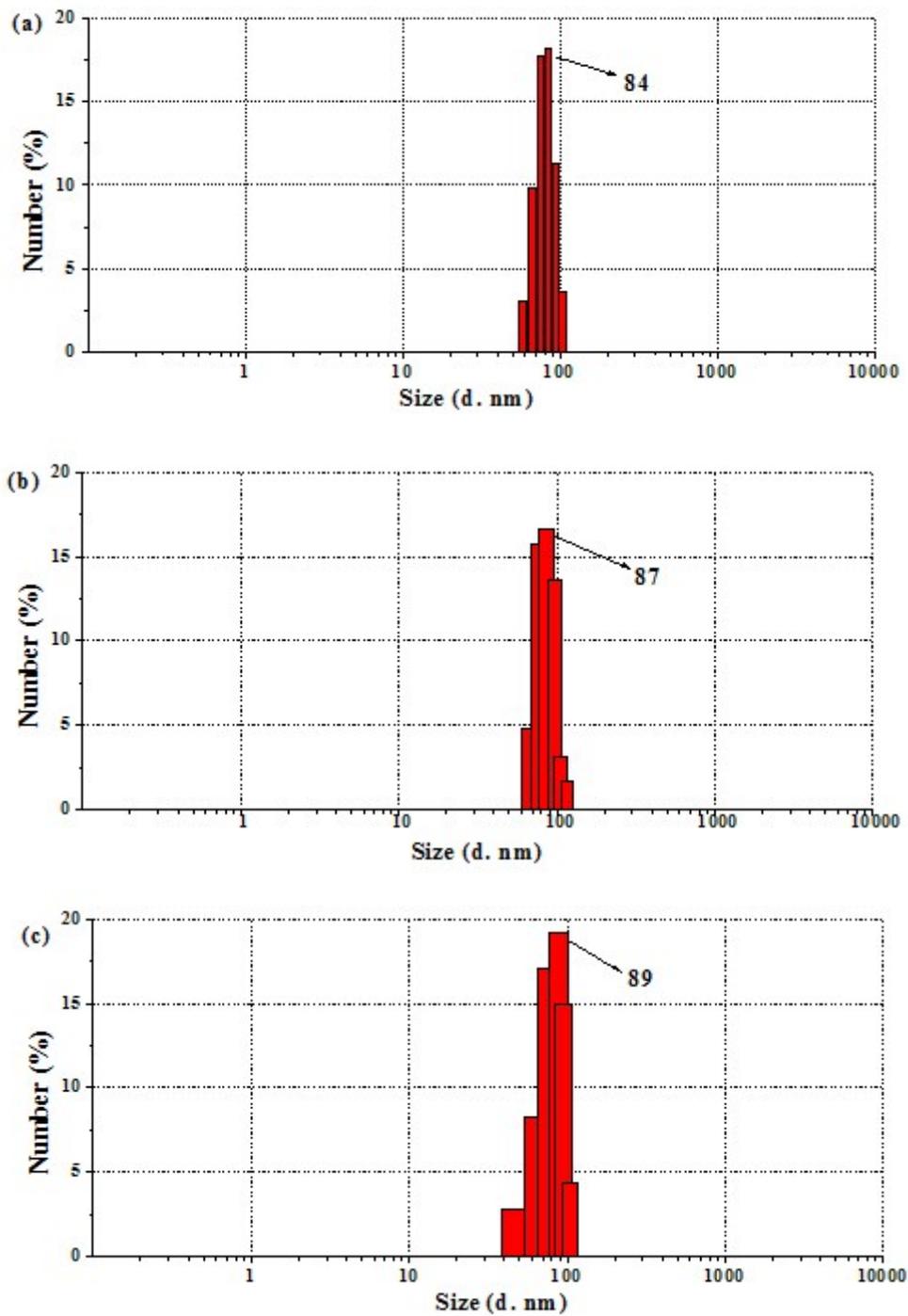


(b)

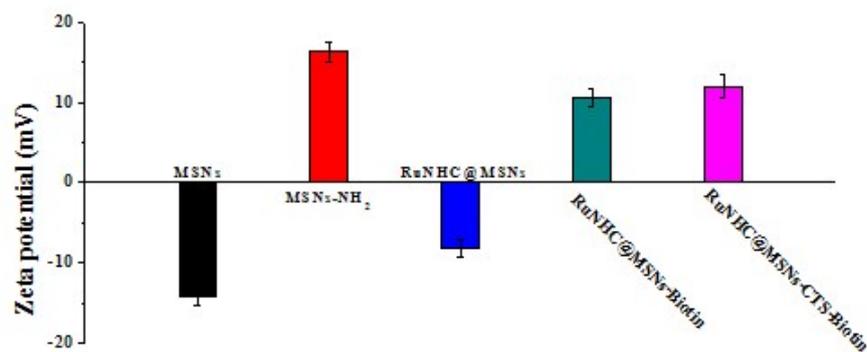


(c)

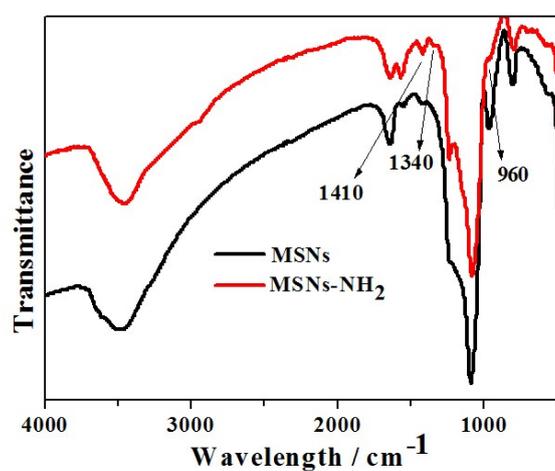
**Fig. S1** The TEM images of MSNs, RuNHC@MSNs-Biotin and RuNHC@MSNs-CTS-Biotin nanoparticles. Scale bars are 50 nm.



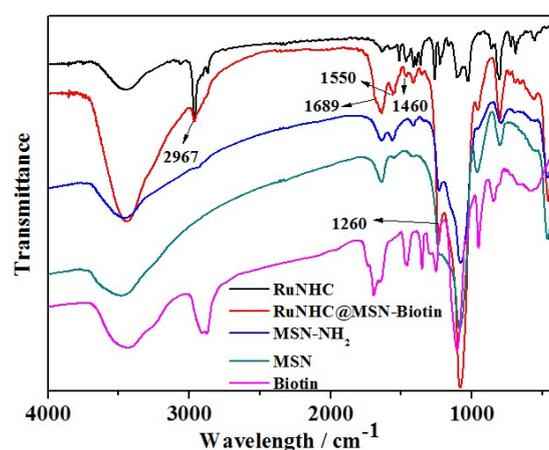
**Fig. S2** Size distribution and mean size of MSNs (a), RuNHC@MSNs-Biotin (b) and RuNHC@MSNs-CTS-Biotin (c) nanoparticles.



**Fig. S3** Zeta potential of MSNs, MSNs-NH<sub>2</sub>, RuNHC@MSNs, RuNHC@MSNs-Biotin and RuNHC@MSNs-CTS-Biotin nanoparticles.



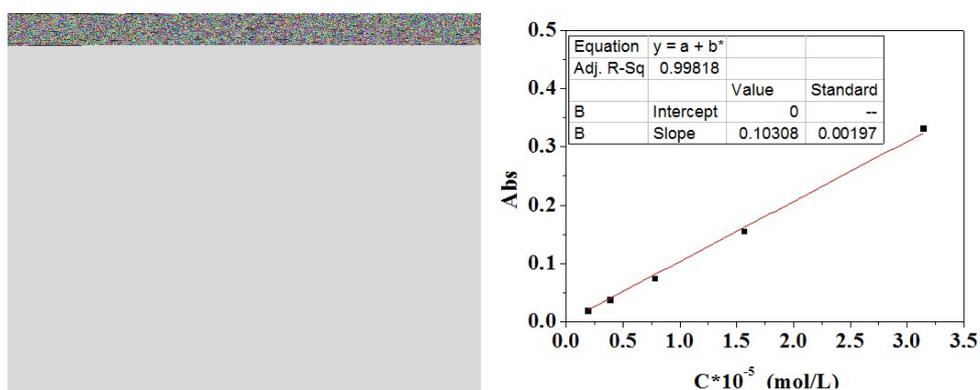
**Fig. S4** FT-IR spectra of MSNs and MSNs-NH<sub>2</sub>.



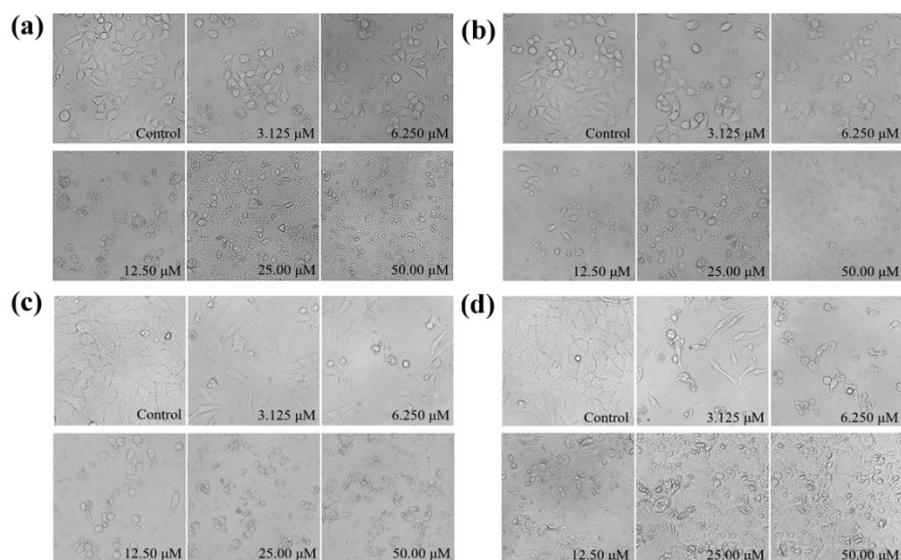
**Fig. S5** IR spectra of RuNHC@MSNs-Biotin.

## Labeling of FITC

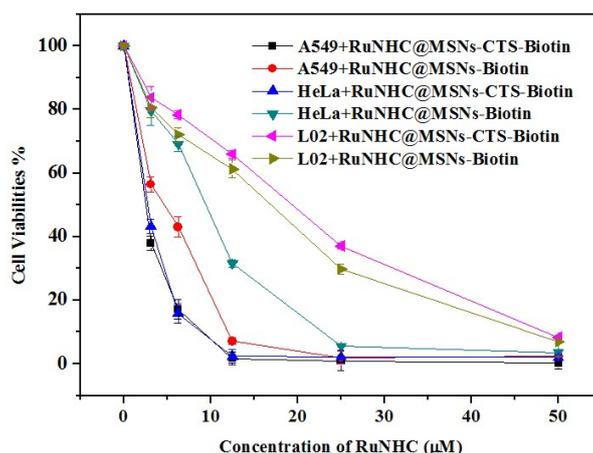
The label of FITC to nanoparticles was tested by UV-vis spectroscopy. As shown in Fig. S7, the absorbance at 495 nm of RuNHC@MSNs-Biotin and RuNHC@MSNs-CTS-Biotin indicated the successful labelling of FITC. And the absorption at 220 nm in UV-vis spectrum of RuNHC@MSNs-Biotin and RuNHC@MSNs-CTS-Biotin proved the successful loading of RuNHC complex. The content of FITC in nanoparticles was also calculated by UV-vis spectroscopy. And the results showed that 34.94  $\mu\text{g}/\text{mg}$  and 83.52  $\mu\text{g}/\text{mg}$  of FITC for RuNHC@MSNs-CTS-Biotin and RuNHC@MSNs-Biotin, respectively.



**Fig. S6** The UV-vis spectra of FITC labeled nano-drugs (left) and the standard line of FITC at 495 nm in PBS 7.4 solution (right).



**Fig. S7** The cellular morphology before and after treated with different concentration of nano-drugs for 48 h. The cells were photographed using an inverted microscope (magnification 200 $\times$ ). (a) A549+RuNHC@MSNs-Biotin; (b) A549+RuNHC@MSNs-CTS-Biotin; (c) HeLa+RuNHC@MSNs-Biotin; (d) HeLa+RuNHC@MSNs-CTS-Biotin.



**Fig. S8** The cell viabilities at various RuNHC concentrations treated for 48 h.

**Table S1** The surface area, pore volume and pore size of MSNs, RuNHC@MSNs-Biotin and RuNHC@MSNs-CTS-Biotin.

Samples	Surface area	Pore Volume	Pore Size
	(m <sup>2</sup> /g)	(cm <sup>3</sup> /g)	(nm)
MSNs	883.811	0.778	2.59
RuNHC@MSNs-Biotin	302.098	0.2328	2.35
RuNHC@MSNs-CTS-Biotin	50.334	0.1223	1.99

**Table S2** IC<sub>50</sub> values of RuNHC and nano-drugs.

Compounds	IC <sub>50</sub> (μM) <sup>a</sup>		
	A549	HeLa	L02
RuNHC	6.88±0.49	9.72±1.21	7.60±0.53
RuNHC@MSNs-Biotin	3.70±0.27	6.41±0.97	17.06±1.20
RuNHC@MSNs-CTS-Biotin	2.08±0.19	1.88±0.19	19.35±0.96
MSNs-Biotin (μg/mL)	>100	>100	>100
MSNs-CTS-Biotin (μg/mL)	>100	>100	>100

<sup>a</sup>Inhibitory activity was assayed by exposure for 48 h to substances and expressed as concentration required to inhibit tumor cell proliferation by 50% (IC<sub>50</sub>). Data are presented as the means ± SDs of three independent experiments.