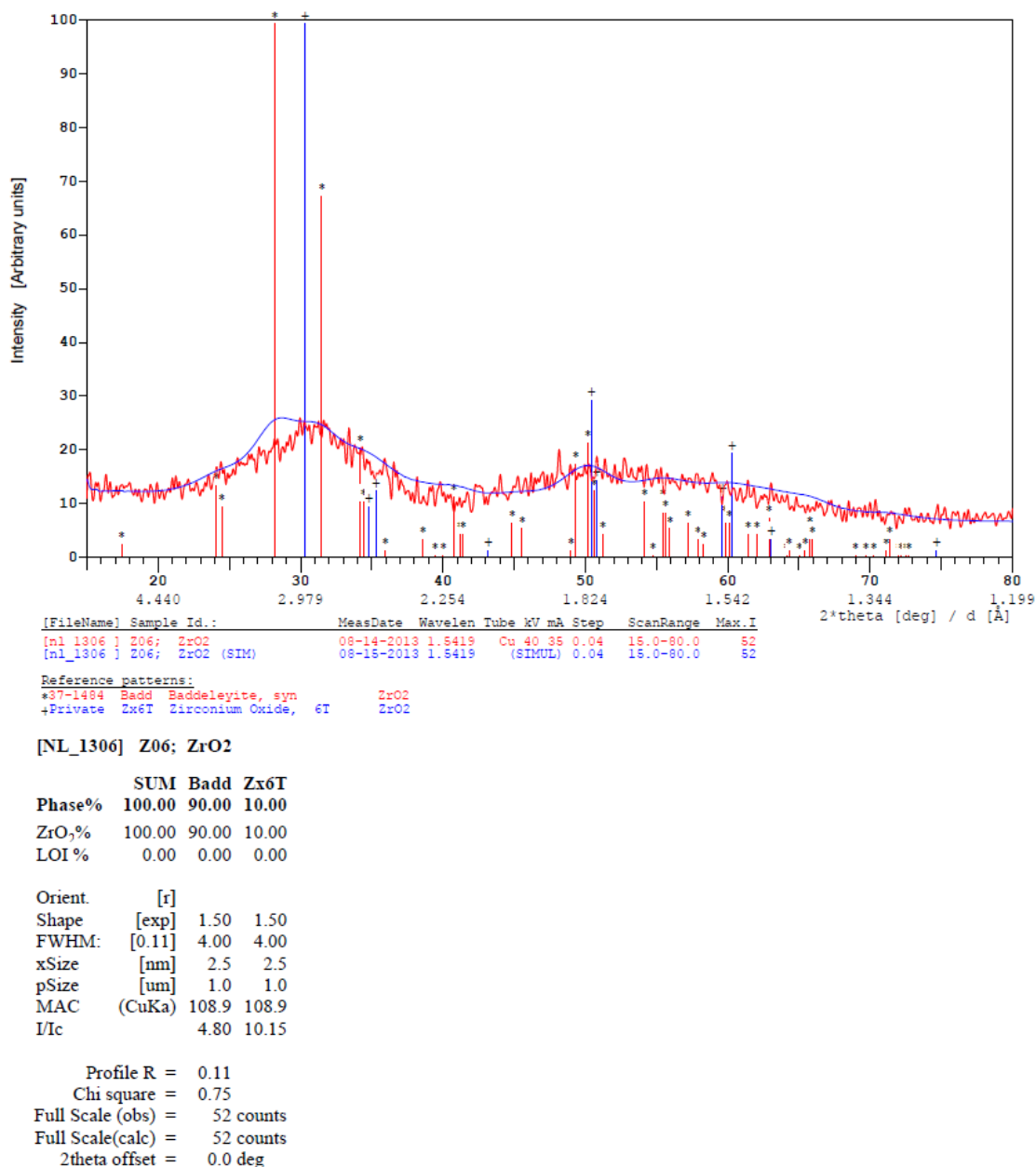


Electronic Supplementary Material to

**Inherently fluorescent and porous zirconia colloid: preparation,  
characterization and drug adsorption studies**

**Porous and fluorescent zirconia particles**

Institute of Materials and Environmental Chemistry - RCNS HAS



**Figure S-1** XRD diffraction of zirconia particles obtained by the method of Widoniak, and evaluation by fitting database diffractograms

## Induction of porosity in zirconia particles

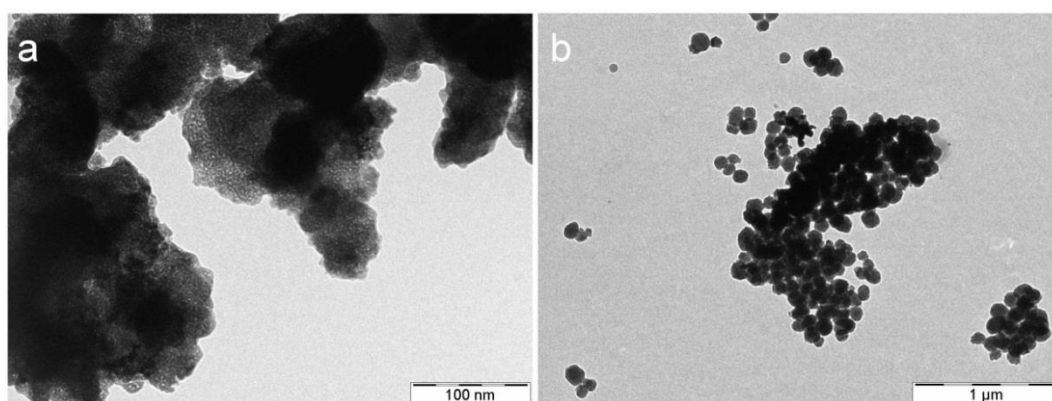


Figure S-2 TEM pictures of zirconia materials obtained in the presence of CTAB in a) water and b) ethanol.

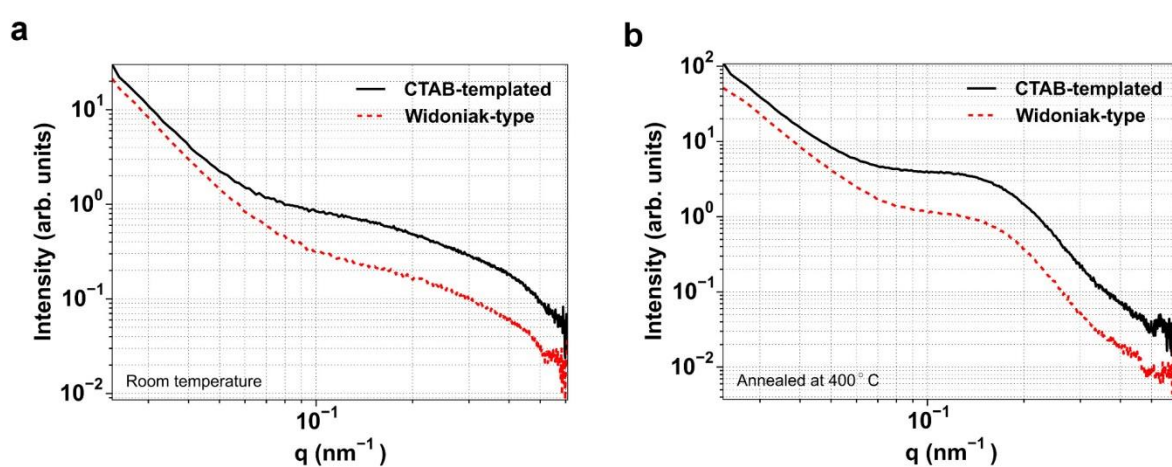


Figure S-3 SAXS curves of CTAB-templated (solid black line) and Widoniak-type ( $\text{Cs}^+$  doped, dashed red line) zirconia powder before (a) and after annealing at 400 °C (b).

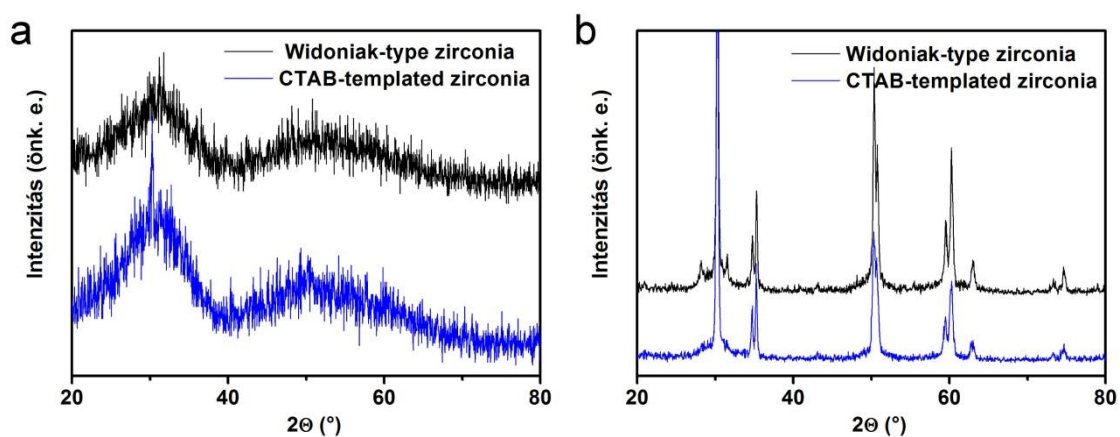
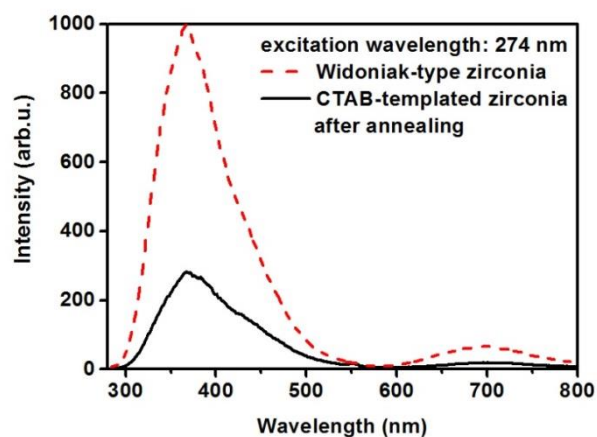
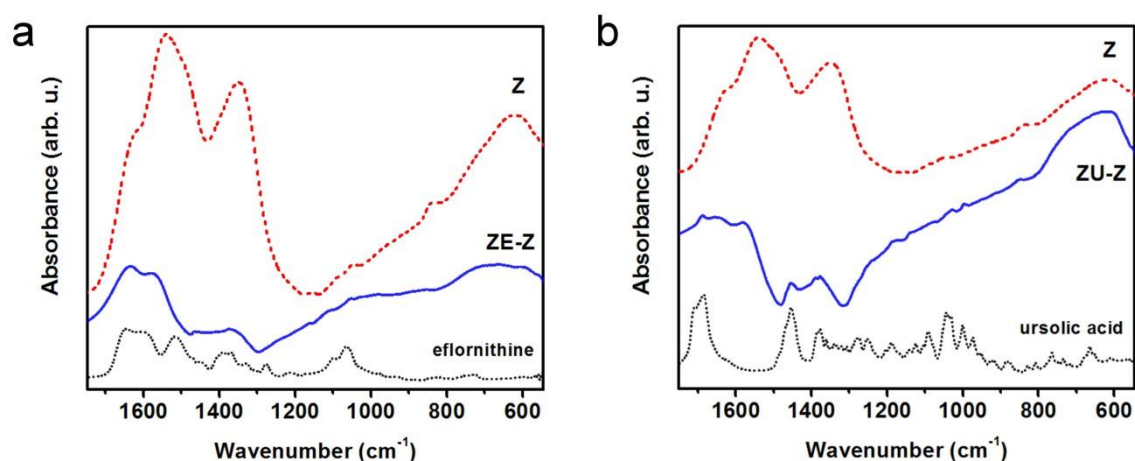


Figure S-4 XRD diffractograms of Widoniak-type non-templated (black line) and CTAB-templated (blue line) zirconia before (a) and after annealing (b).

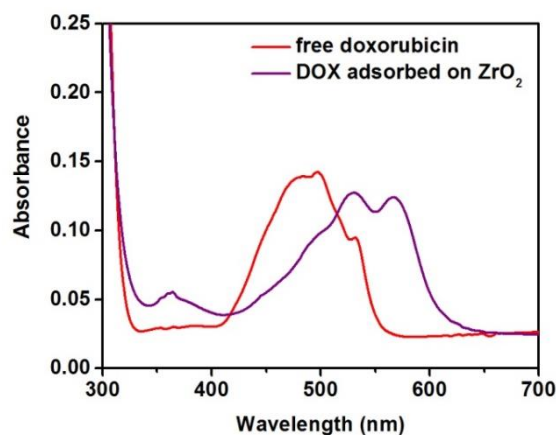


**Figure S-5** Fluorescence of resuspended powder of CTAB-templated zirconia (solid black line) and Widoniak-type zirconia ( $\text{Cs}^+$  ions) (dashed red line).

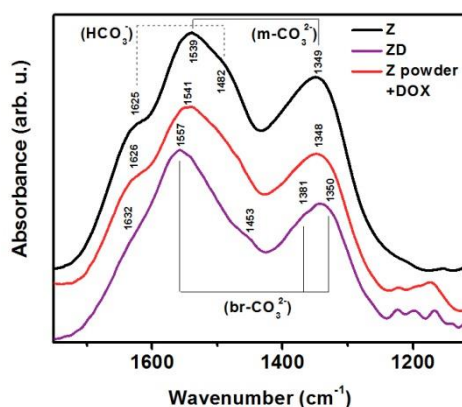
### Drug adsorption studies



**Figure S-6** Infrared spectra of Widoniak-type zirconia (dashed red line), the subtracted spectrum ZE-Z or ZU-Z (solid blue line), and the corresponding drug molecule (dotted black line). ZE (a) and ZU (b) denominate DFMO and ursolic acid loaded zirconia, respectively.



**Figure S-7** UV-visible spectra of free doxorubicin in aqueous solution (red line) and adsorbed doxorubicin after addition to native zirconia suspension.

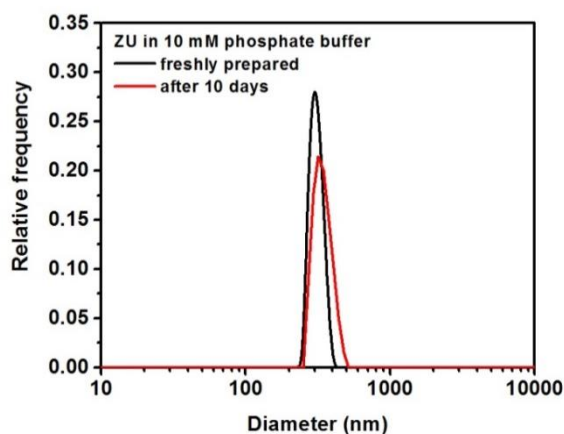


**Figure S-8** FTIR spectra of native zirconia in the absence (black line) and in the presence of doxorubicin (red and purple line). Doxorubicin became purple upon addition to zirconia kept in suspension (purple line) and remained red upon addition to dried and resuspended zirconia (red line). (The mixtures were in HEPES, background subtraction was applied.)

**Table S-1 Results of the least-squares fitting for Widoniak-type zirconia before and after drug adsorption**

	Scaling factor of initial power-law	Exponent of initial power-law	Scaling factor of the Debye-Bueche part	Correlation distance (nm)	Relative weight of Debye-Bueche part
Z	0.04 +/- 0.0007	-3.6 +/- 0.01	0.249 +/- 0.002	0.356 +/- 0.002	6.2 +/- 0.1
ZE	0.208 +/- 0.001	-3.337 +/- 0.005	0.295 +/- 0.003	0.314 +/- 0.002	1.42 +/- 0.02
ZD	0.00768 +/- 6e-05	-3.644 +/- 0.006	0.0184 +/- 0.0001	0.272 +/- 0.002	2.39 +/- 0.03
ZU	0.0401 +/- 0.0004	-3.647 +/- 0.007	0.128 +/- 0.0009	0.311 +/- 0.001	3.19 +/- 0.04

## Radiolabeling and normal distribution study



**Figure S-9** Size distribution functions of ZU sample dispersed in 10 mM phosphate buffer upon preparation and after 10 days. No ultrasonication was applied before the second measurement.