

## Supplementary Information for

### Fluorine-mediated synthesis of anisotropic iron oxide nanostructures for efficient T<sub>2</sub>-weighted magnetic resonance imaging

*Tao Sun, Yiding Liu\*, Chunyu Zhou, Liang Zhang, Xun Kang, Shilin Xiao, Zhongsheng Xu, Mengmeng Du, Yun Liu, Gang Liu, Mingfu Gong\*, Dong Zhang\**

This material includes:

**Fig. S1** TEM images of iron oxide nanoparticles synthesized without NaF addition.

**Fig. S2** The particle size distribution by TEM results of iron oxide nanoparticles in **Fig. 1**.

**Fig. S3** TEM images of iron oxide nanoparticles synthesized using a) NaOL and b) NaCl to replace the NaF and with other conditions same as octapod nanoparticles.

**Fig. S4** TEM images of octapod nanoparticles synthesized at the NaF/Fe(CO)<sub>5</sub> molar ratio of a) 1.25:1 and b) 1.75:1.

**Fig. S5** TEM images of cubic nanocrystal clusters synthesized at the NaF/Fe(CO)<sub>5</sub> molar ratio of 2:1.

**Fig. S6** TEM images of iron oxide nanoparticles synthesized with the OA/Fe(CO)<sub>5</sub> molar ratio of a) 2:1 and b) 2.5:1.

**Fig. S7** TEM images of iron oxide particles synthesized with a longer aging time of 2 hours at 310 °C and with other conditions same as cubic nanocrystal clusters.

**Fig. S8** XPS spectra of cubic nanocrystal clusters (CNC-90): a) Survey XPS spectrum; b) high resolution Fe2p spectrum; c) high resolution F1s spectrum.

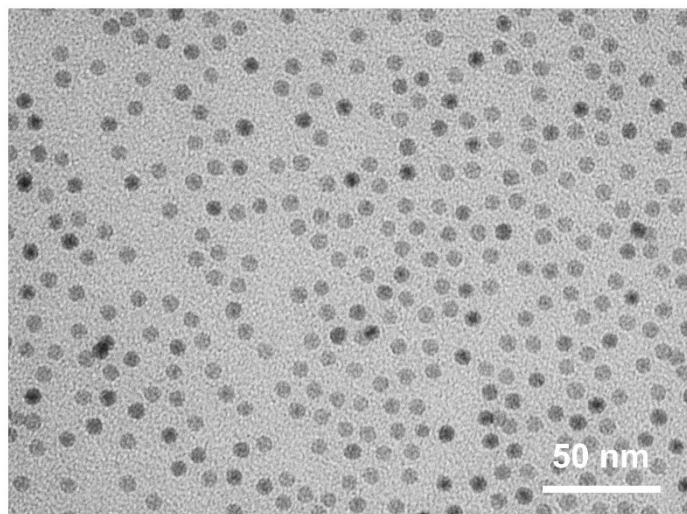
**Fig. S9** TEM image of spherical iron oxide nanoparticles (SNP-18).

**Fig. S10** The colloidal diameter of water-dispersible SNP-18 ( $19.5 \pm 2.8$  nm), ONP-40 ( $42.8 \pm 3.2$  nm), CNC-60 ( $63.4 \pm 3.9$  nm), CNC-90 ( $94.7 \pm 4.6$  nm), and CNC-120 ( $130.1 \pm 6.8$  nm) obtained from dynamic light scattering (DLS) measurements.

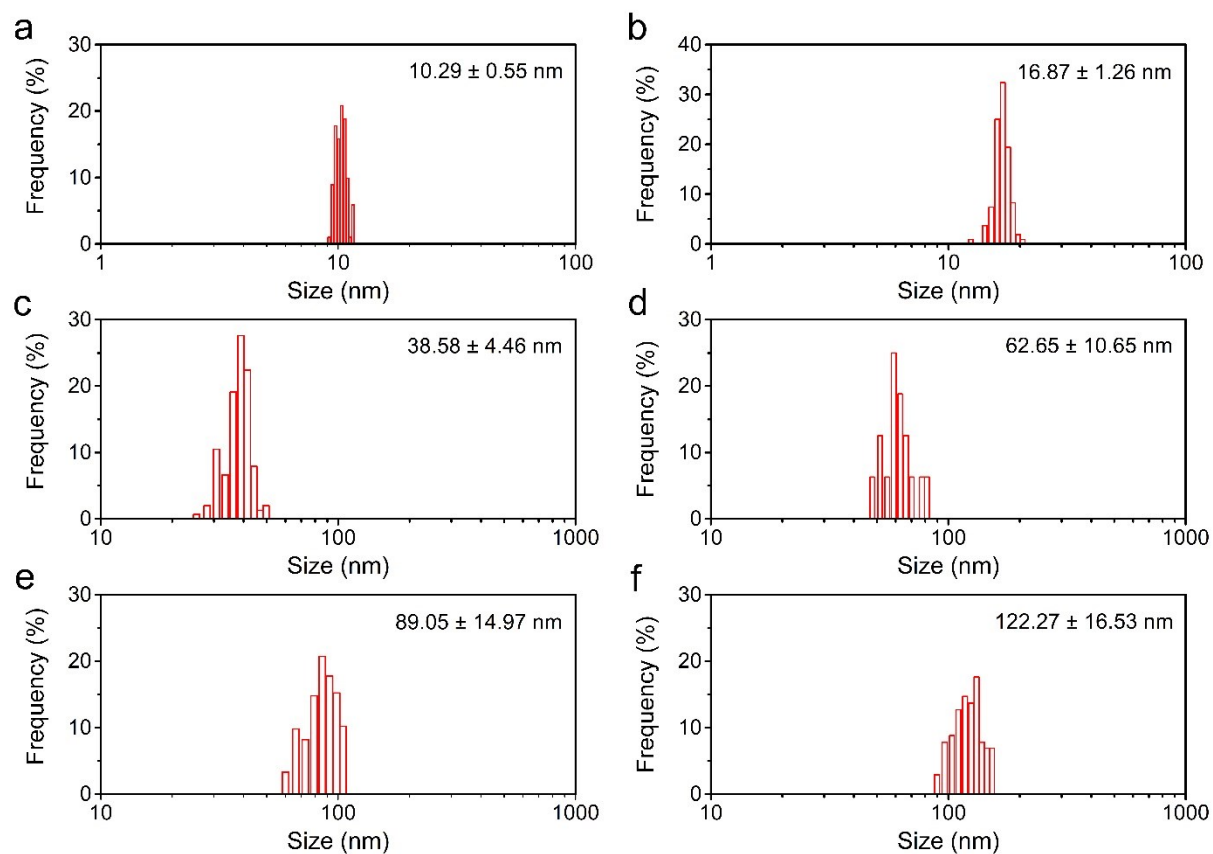
**Fig. S11** The Zeta potential of water-dispersible SNP-18, ONP-40, CNC-60, CNC-90, and CNC-120 obtained from electrophoretic light scattering (ELS) measurements.

**Fig. S12** T<sub>1</sub>WI images (a), relative signal intensity changes (b) of SNP-18, ONP-40 and CNC-90 at 3.0 T; Linear fitting of 1/T<sub>1</sub> over different Fe concentrations of SNP-18 (c).

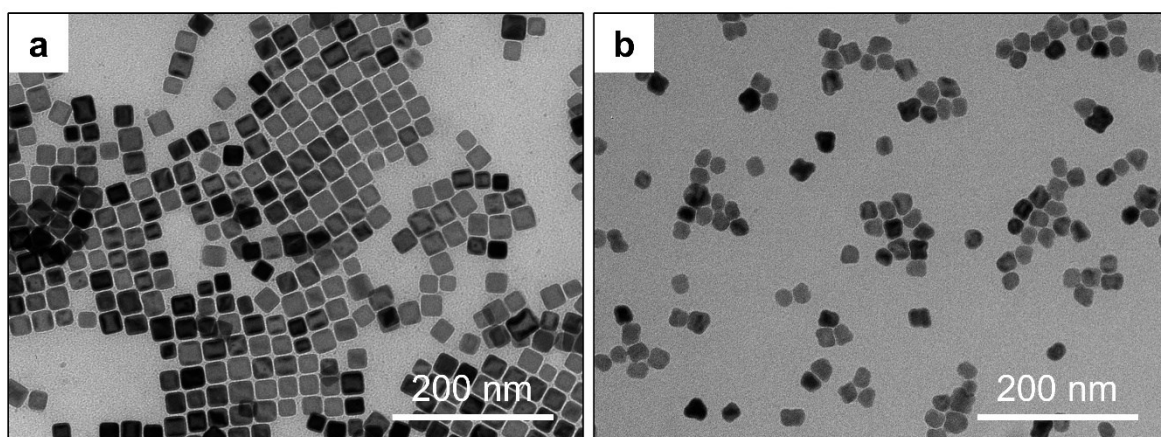
**Fig. S13** UV-Vis spectra (a) and temperature increase curves (b-c) of water, SNP-18, ONP-40 and CNC-90 suspensions with identical Fe concentrations (b: 100 mg/L Fe; c: 200 mg/L Fe) (0.4 mL suspensions irradiated by an 808 nm NIR laser at a power density of 2.0·W cm<sup>-2</sup>).



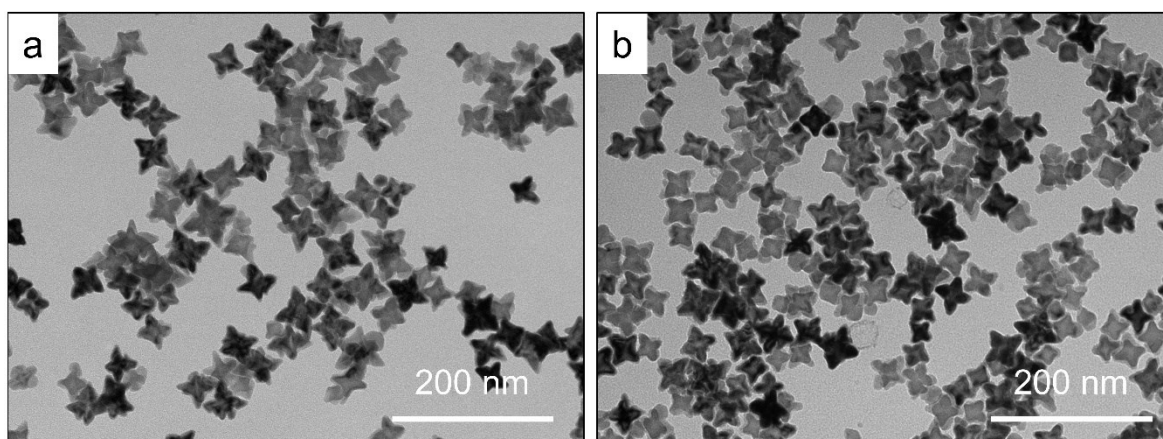
**Fig. S1** TEM images of iron oxide nanoparticles synthesized without NaF addition.



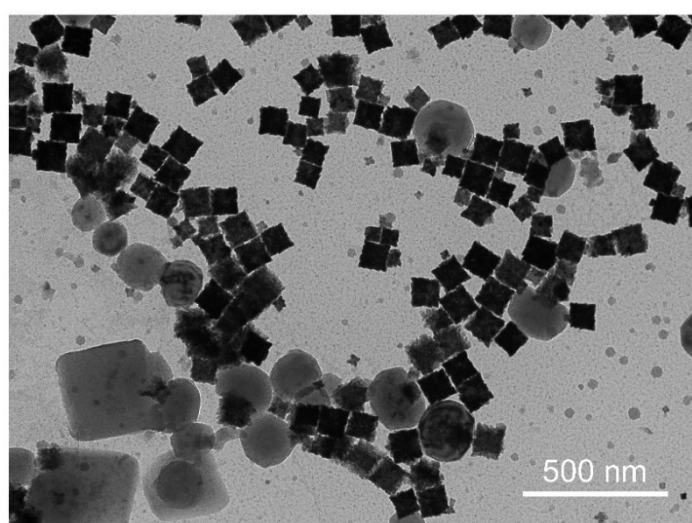
**Fig. S2** The particle size distribution by TEM results of iron oxide nanoparticles in **Fig. 1**.



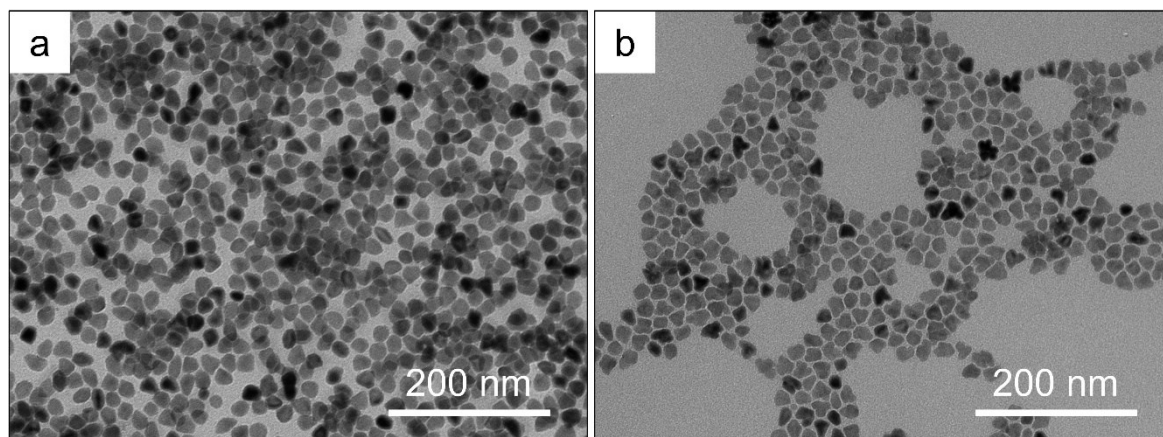
**Fig. S3** TEM images of iron oxide nanoparticles synthesized using a) NaOL and b) NaCl to replace the NaF and with other conditions same as octapod nanoparticles.



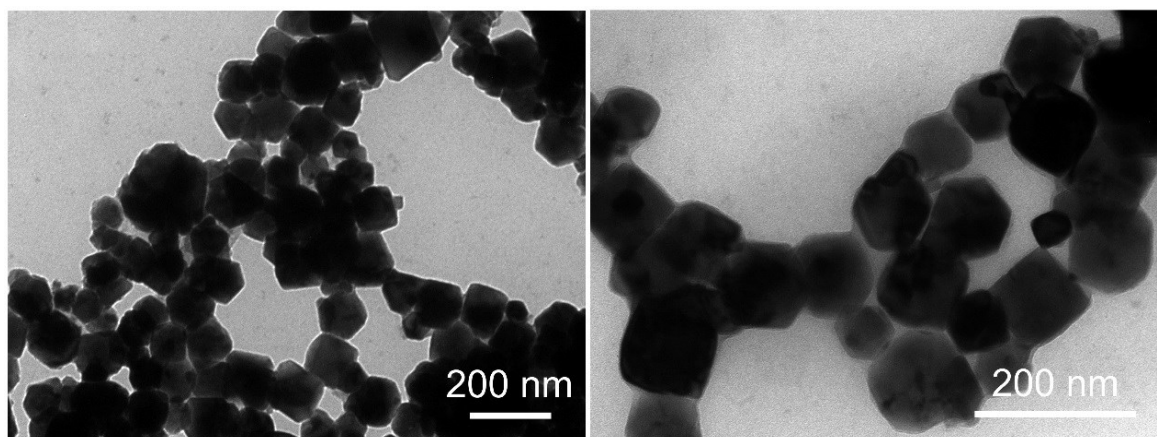
**Fig. S4** TEM images of octapod nanoparticles synthesized at the NaF/Fe(CO)<sub>5</sub> molar ratio of a) 1.25:1 and b) 1.75:1.



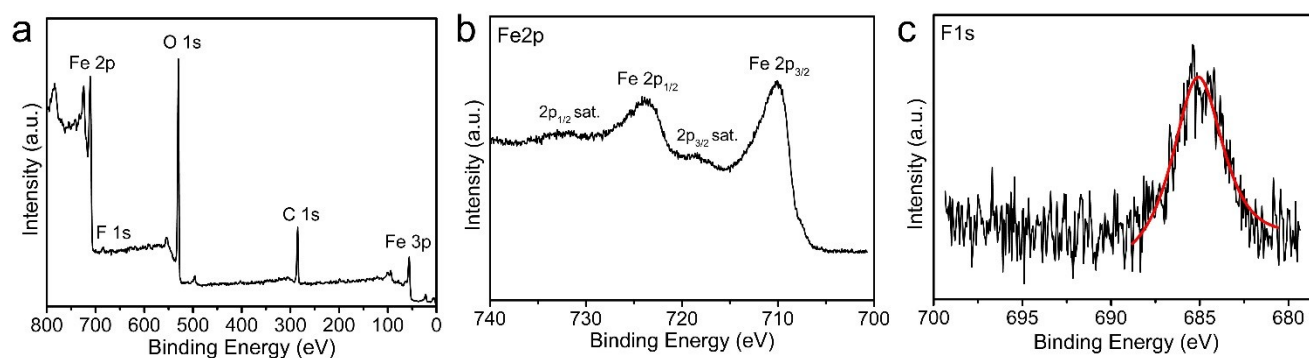
**Fig. S5** TEM images of cubic nanocrystal clusters synthesized at the NaF/Fe(CO)<sub>5</sub> molar ratio of 2:1.



**Fig. S6** TEM images of iron oxide nanoparticles synthesized with the OA/Fe(CO)<sub>5</sub> molar ratio of a) 2:1 and b) 2.5:1.

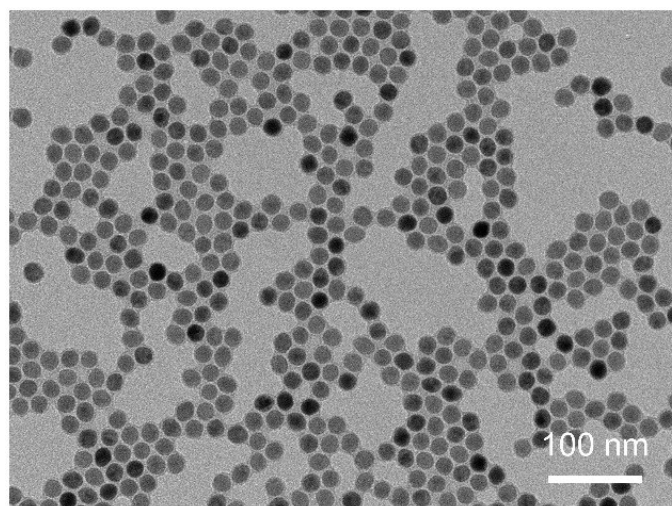


**Fig. S7** TEM images of iron oxide particles synthesized with a longer aging time of 2 hours at 310 °C and with other conditions same as cubic nanocrystal clusters.

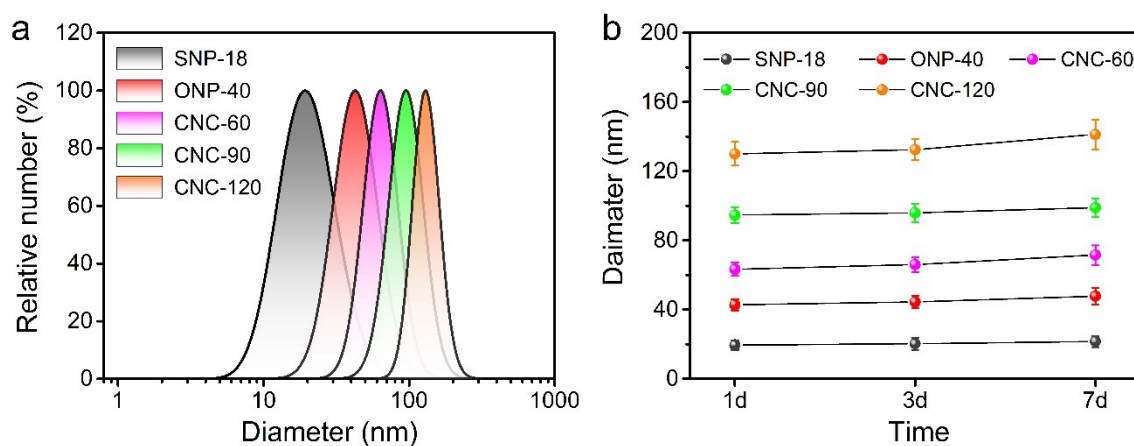


**Fig. S8** XPS spectra of cubic nanocrystal clusters (CNC-90): a) Survey XPS spectrum; b) high resolution Fe2p spectrum; c) high resolution F1s spectrum.

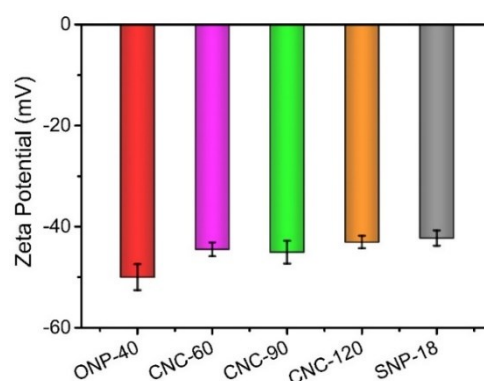




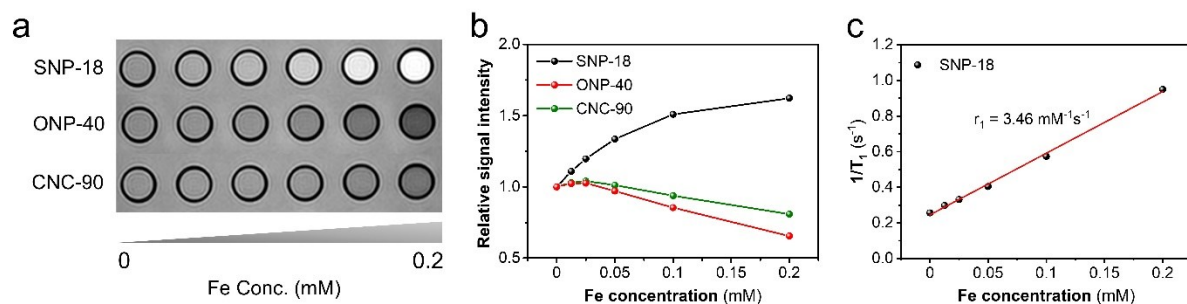
**Fig. S9** TEM image of spherical iron oxide nanoparticles (SNP-18).



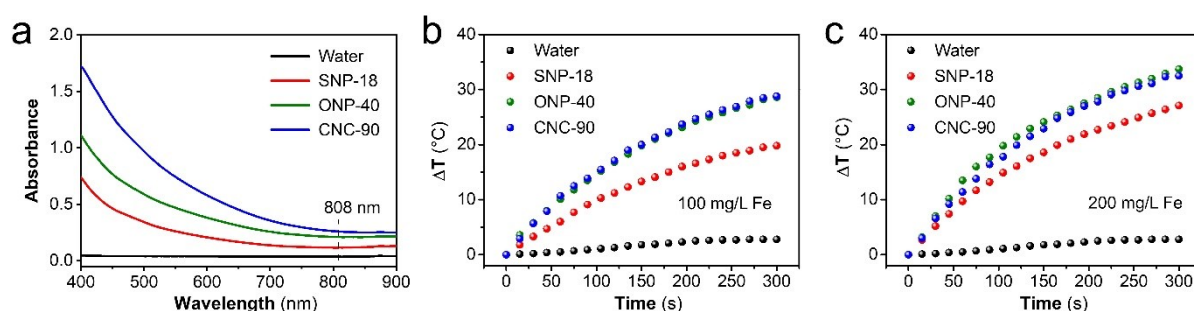
**Fig. S10** The colloidal diameter of water-dispersible SNP-18 ( $19.5 \pm 2.8$  nm), ONP-40 ( $42.8 \pm 3.2$  nm), CNC-60 ( $63.4 \pm 3.9$  nm), CNC-90 ( $94.7 \pm 4.6$  nm), and CNC-120 ( $130.1 \pm 6.8$  nm) obtained from dynamic light scattering (DLS) measurements.



**Fig. S11** The Zeta potential of water-dispersible SNP-18, ONP-40, CNC-60, CNC-90, and CNC-120 obtained from electrophoretic light scattering (ELS) measurements.



**Fig. S12**  $T_1$ WI images (a), relative signal intensity changes (b) of SNP-18, ONP-40 and CNC-90 at 3.0 T; Linear fitting of  $1/T_1$  over different Fe concentrations of SNP-18 (c).



**Fig. S13** UV-Vis spectra (a) and temperature increase curves (b-c) of water, SNP-18, ONP-40 and CNC-90 suspensions with identical Fe concentrations (b: 100 mg/L Fe; c: 200 mg/L Fe) (0.4 mL suspensions irradiated by an 808 nm NIR laser at a power density of  $2.0 \text{ W cm}^{-2}$ ).