Electronic Supplementary Material (ESI) for ChemComm.

Electronic Supporting Information

Visible-light circular dichroism of colourless chiral organic compounds enabled by interfacial charge-transfer transitions

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Here, we show experimental results of dynamic light scattering measurements (Delsa™Nano HC, BECKMAN COULTER) of aqueous dispersions of TiO_2 nanoparticles with average particle size of ca. 1 nm and ca. 10 nm and UV-visible absorption and CD spectra of catechol (CA) added aqueous TiO_2 nanoparticle dispersion (particle size: ca. 10 nm) and those of *L*-ascorbic acid (*L*-AA) added aqueous TiO_2 nanoparticle dispersion (particle size: ca. 1 nm).

We measured particle size distributions of two kinds of TiO_2 nanoparticles which were prepared by changing the amount of isopropanol (IPA) that was used as the solvent for titanium(IV) isopropoxide according to the method described in Experimental method in our paper. The observed dynamic light scattering data were converted to particle size distributions by CONTIN analysis. As shown in Fig. S1, the average particle size of TiO_2 nanoparticles prepared with 3.7 mL of IPA was estimated to be 11.2 ± 1.1 nm and the one of TiO_2 nanoparticles prepared with 7.4 mL of IPA was estimated to be 1.3 ± 0.3 nm. The reduction in the concentration of titanium(IV) isopropoxide tends to decrease the particle size. 1.3 nm-size and 11.2 nm-size TiO_2 nanoparticles are abbreviated to 1 nm- and 10 nm-TiO_2 nanoparticles, respectively, hereafter.

Fig. S2(a) and S2(b) show UV-visible absorption and CD spectra of aqueous 10 nm-TiO_2 nanoparticle dispersion with CA, respectively. The CA-added TiO_2 nanoparticle dispersion showed a broad absorption band due to interfacial charge-transfer (ICT) transitions in the visible region between 400 and 600 nm, while no CD signals, as shown in Fig. S2(b). This result clearly

indicates that the visible-light CD signals in TiO_2-*L*-AA, TiO_2-*D*-AA, and TiO_2-*L*-NA originates from the chirality of each organic compound.

In order to investigate size effects of TiO_2 nanoparticles on *g* factor of visible-light CD, we measured UV-visible absorption and CD spectra of aqueous 1 nm-TiO_2 nanoparticle dispersions with difference concentrations (0.5, 1, and 2 mM) of *L*-AA. All the 1 nm-TiO_2-*L*-AA dispersions showed a broad absorption band due to interfacial charge-transfer (ICT) transitions and positive CD signals in the visible region between 400 and 600 nm, similarly to the 10 nm-TiO_2-*L*-AA described in our paper. Fig. S3(c) shows *g* factor spectra of the 1 nm-TiO_2-*L*-AA dispersions. The *g* factor is independent of the concentration of *L*-AA. The *g* value at 500 nm is ca. 2.9×10^{-4}, which is almost the same as that (ca. 3.0×10^{-4} at 500 nm) of TiO_2-*L*-AA. This result reveals no size effects on the *g* factor of the visible-light CD.

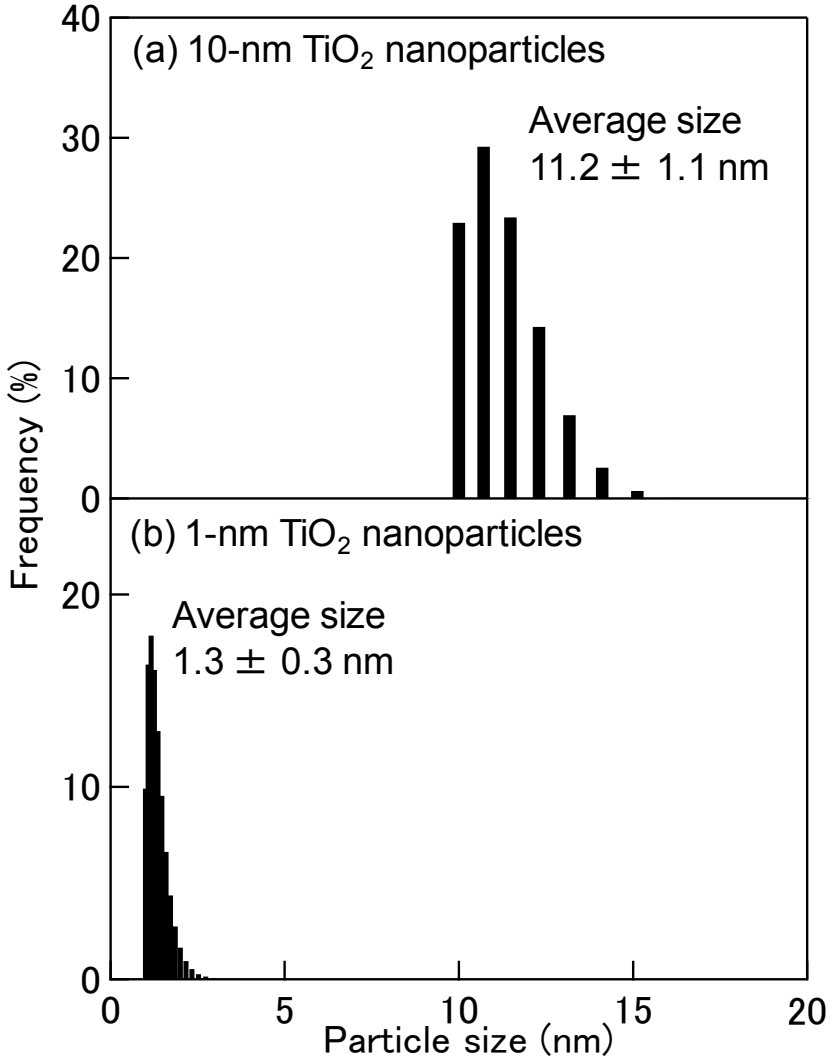

Fig. S1 Particle size distributions of TiO_2 nanoparticles prepared with (a) 3.7 mL and (b) 7.4 mL of isopropanol. Dynamic light scattering data were converted to size distributions by CONTIN analysis.

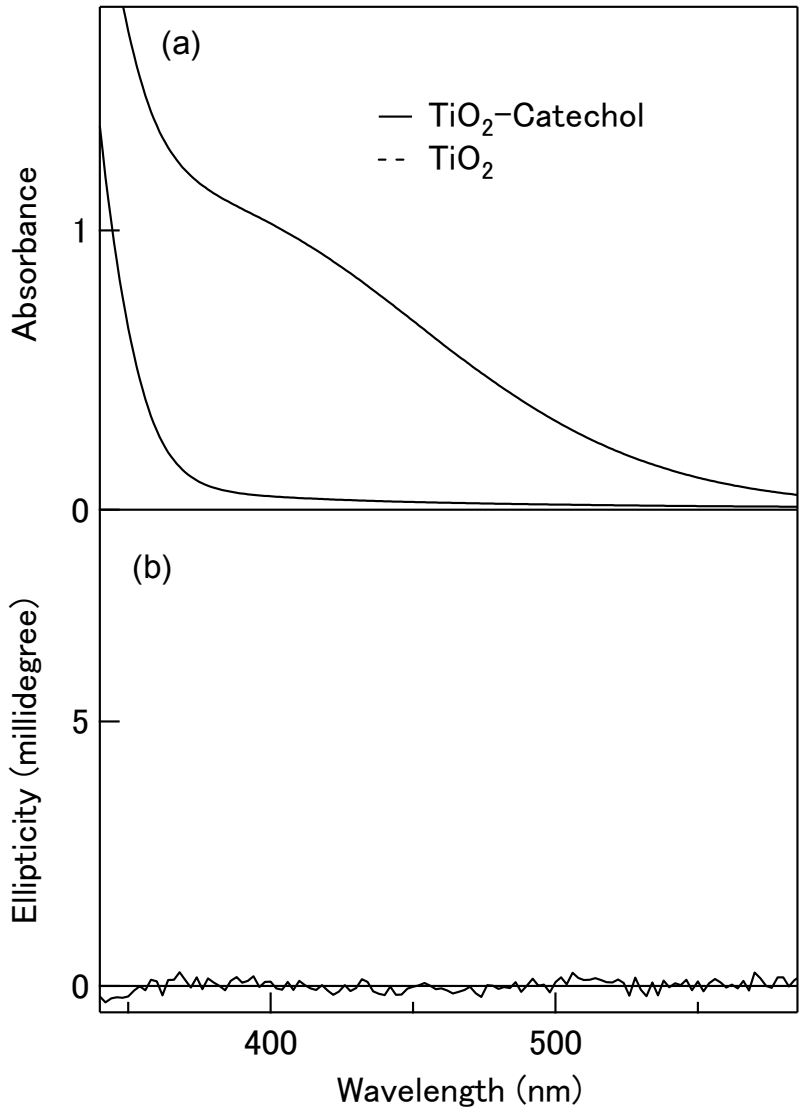

Fig. S2 (a) UV-visible absorption and (b) CD spectra of TiO_2–CA aqueous dispersion.

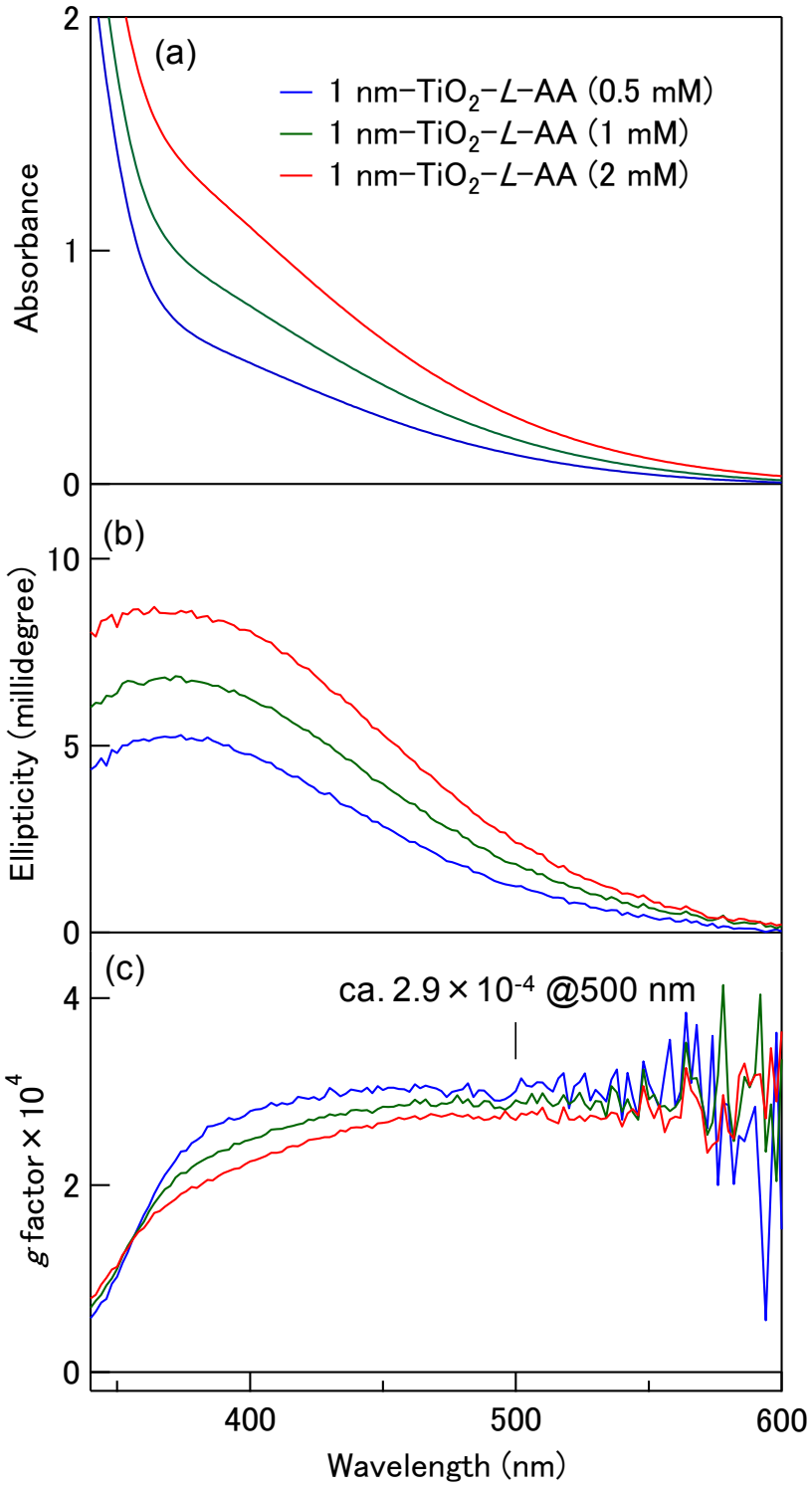

Fig. S3 (a) UV-visible absorption and (b) circular dichroism (CD) and (c) *g* value spectra of aqueous 1 nm-TiO_2 nanoparticle dispersions with difference concentrations of *L*-AA (blue: 0.5 mM, green:1 mM, red: 2 mM). In the absorption and CD experiments, the same samples were measured.