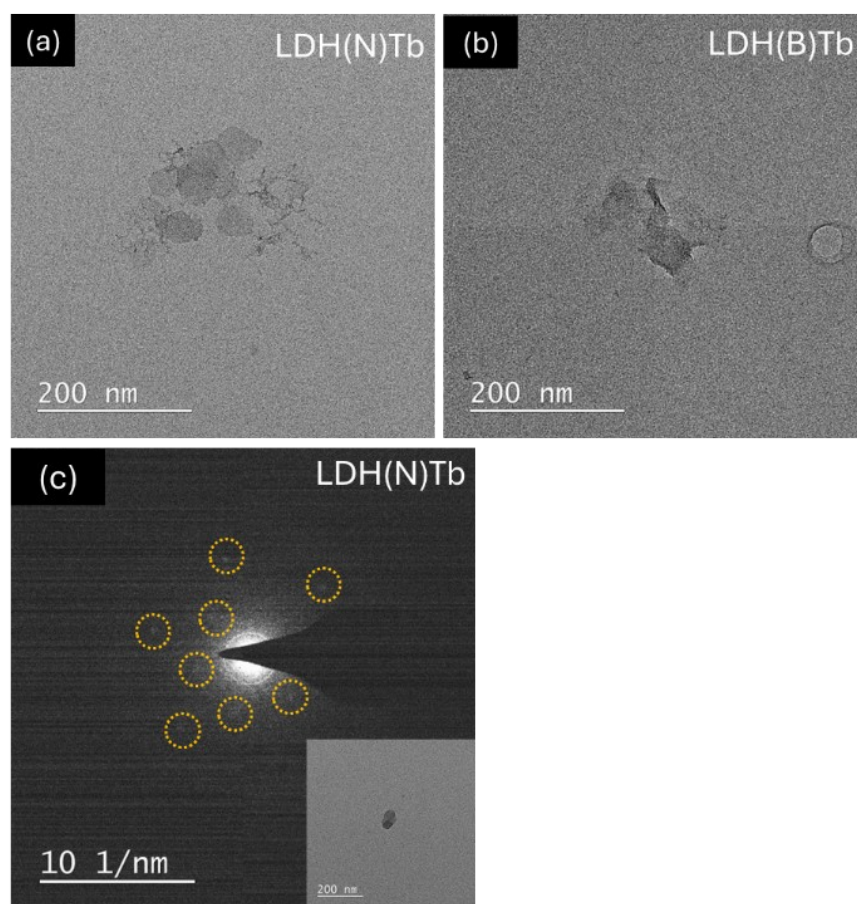


## Benzoate-mediated generation of front-back reversible photoluminescence in transparent polymer/LDH:Tb,Eu nanocomposite films

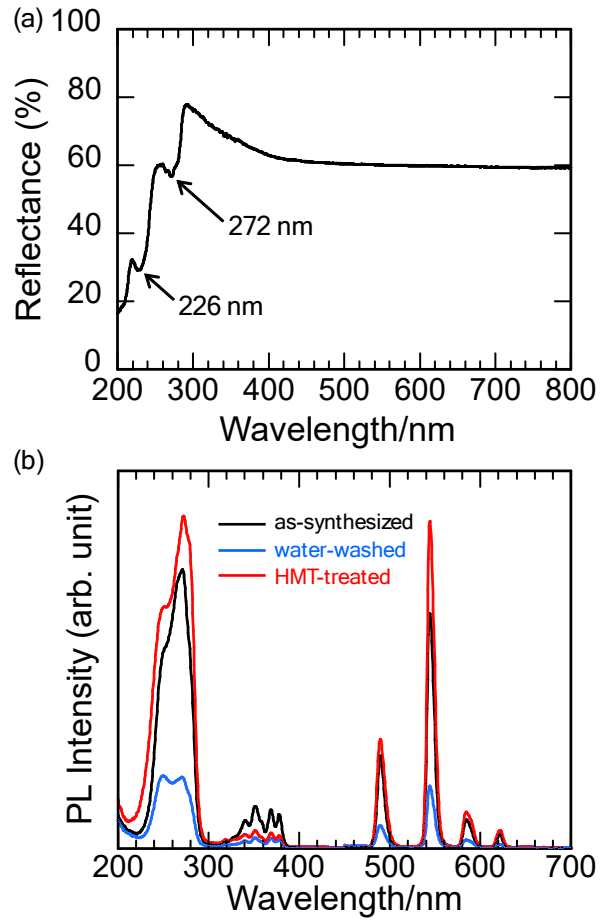
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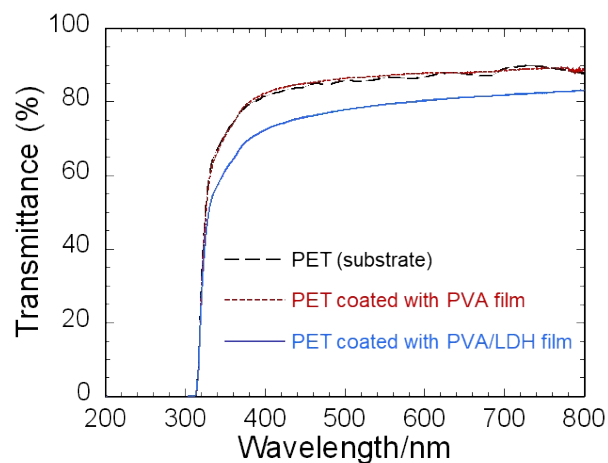
\* Corresponding author. E-mail address: shinobu@aplc.keio.ac.jp (S. Fujihara)



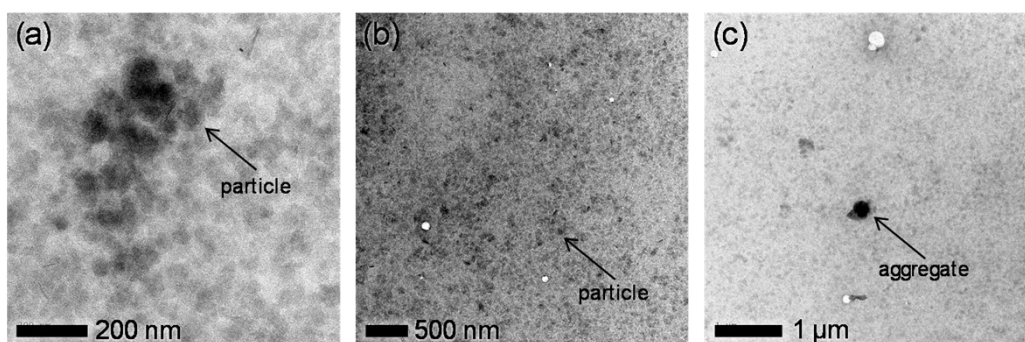
**Fig. S1** FETEM images of (a) the LDH(N)Tb and (b) the LDH(B) Tb powder and (c) SAED pattern of the former.



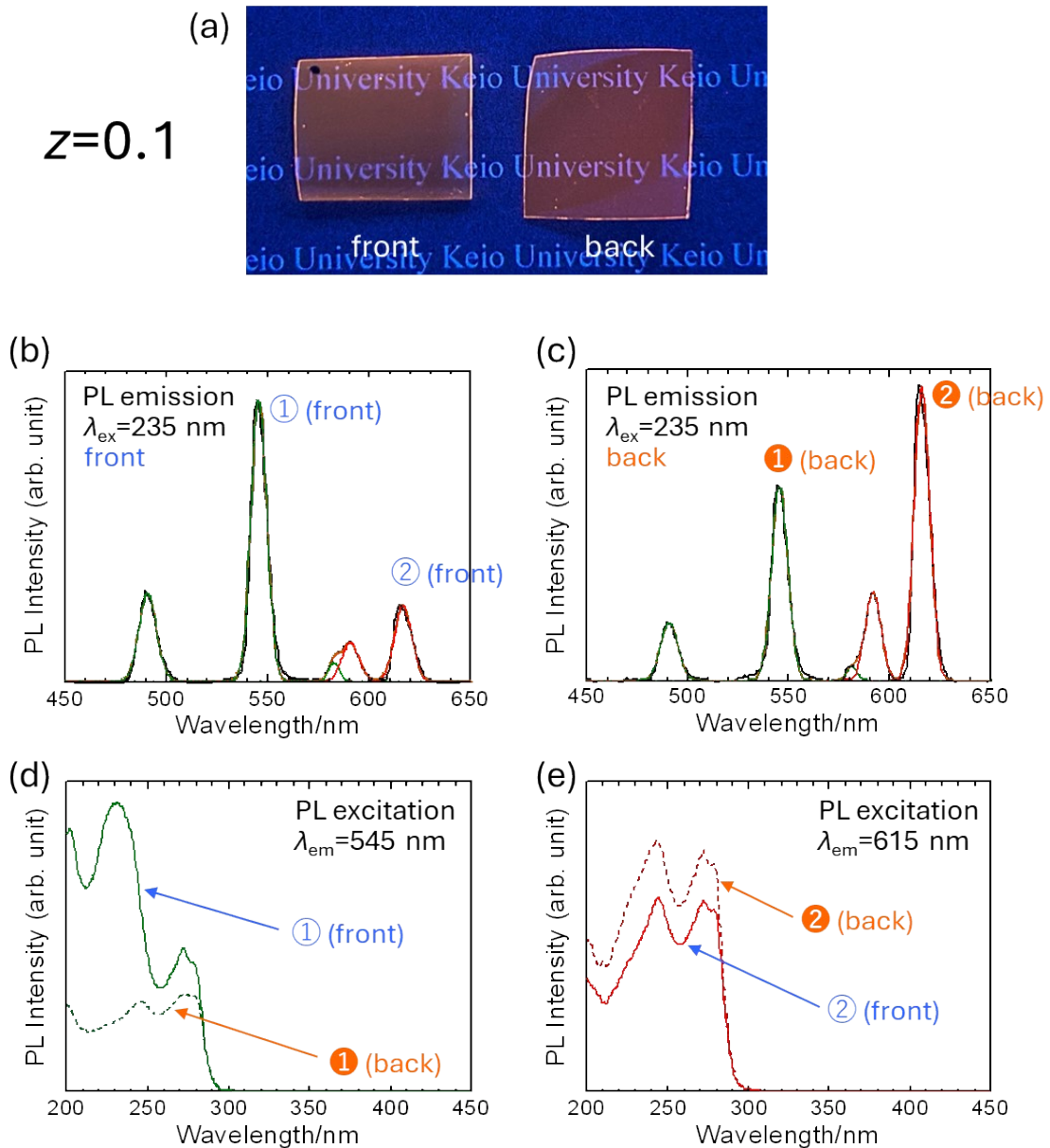
**Fig. S2** (a) A diffuse reflectance spectrum of HMT and (b)  $PL_{ex}$  and  $PL_{em}$  spectra of the as-synthesized LDH(N)Tb sample, the water-washed LDH(N)Tb sample, and the HMT-treated LDH(N)Tb sample obtained by the following experiment. Firstly, LDH(N)Tb was prepared as the powder through the process described in the main text. Secondly, the powder was dispersed in deionized water under stirring for washing. Finally, the water-washed powder was treated with HMT by dispersing in the aqueous HMT solution under stirring.



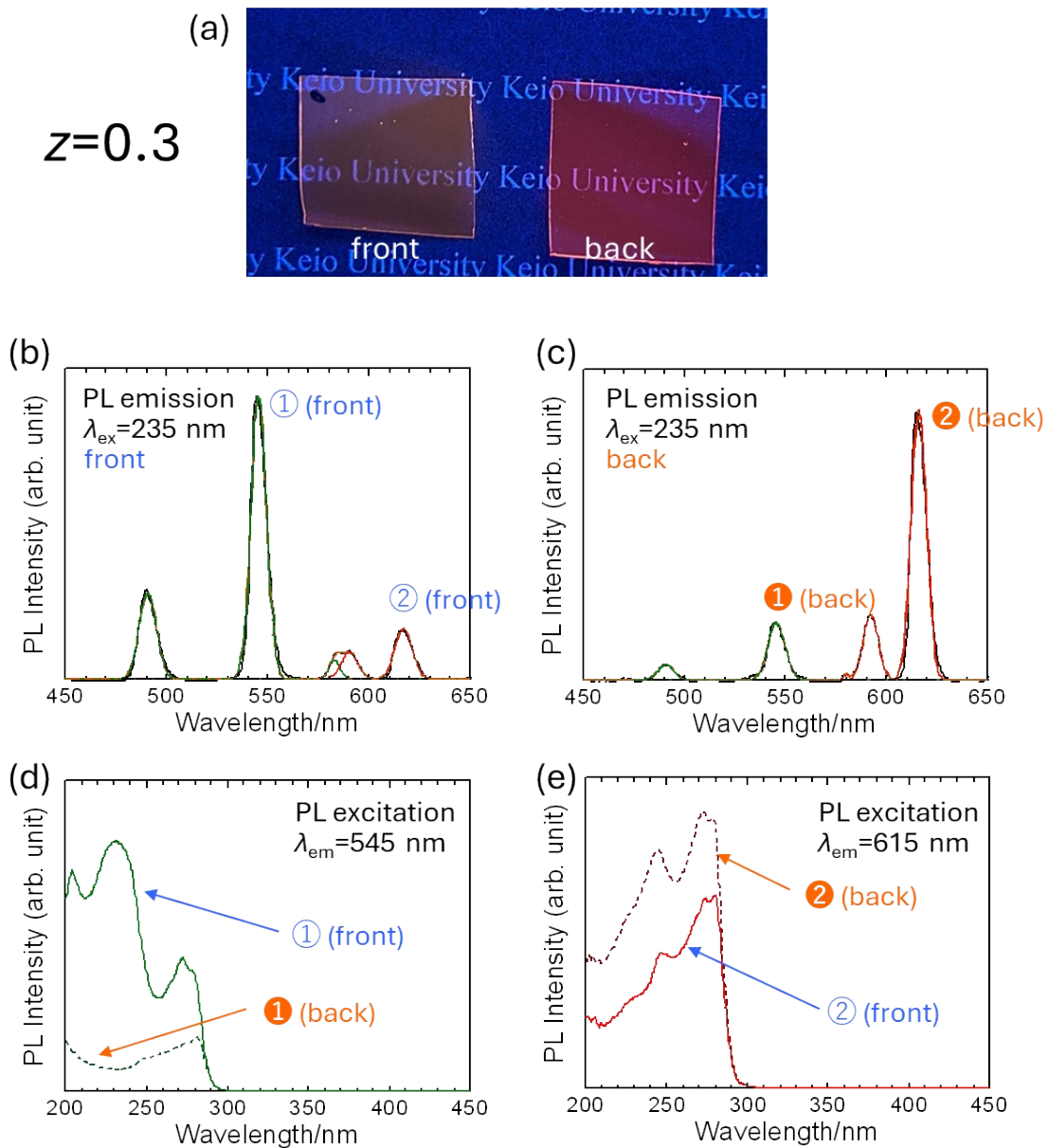
**Fig. S3** Optical transmission spectra of the bare, the PVA-coated, and the PVA/LDH-coated PET substrate.



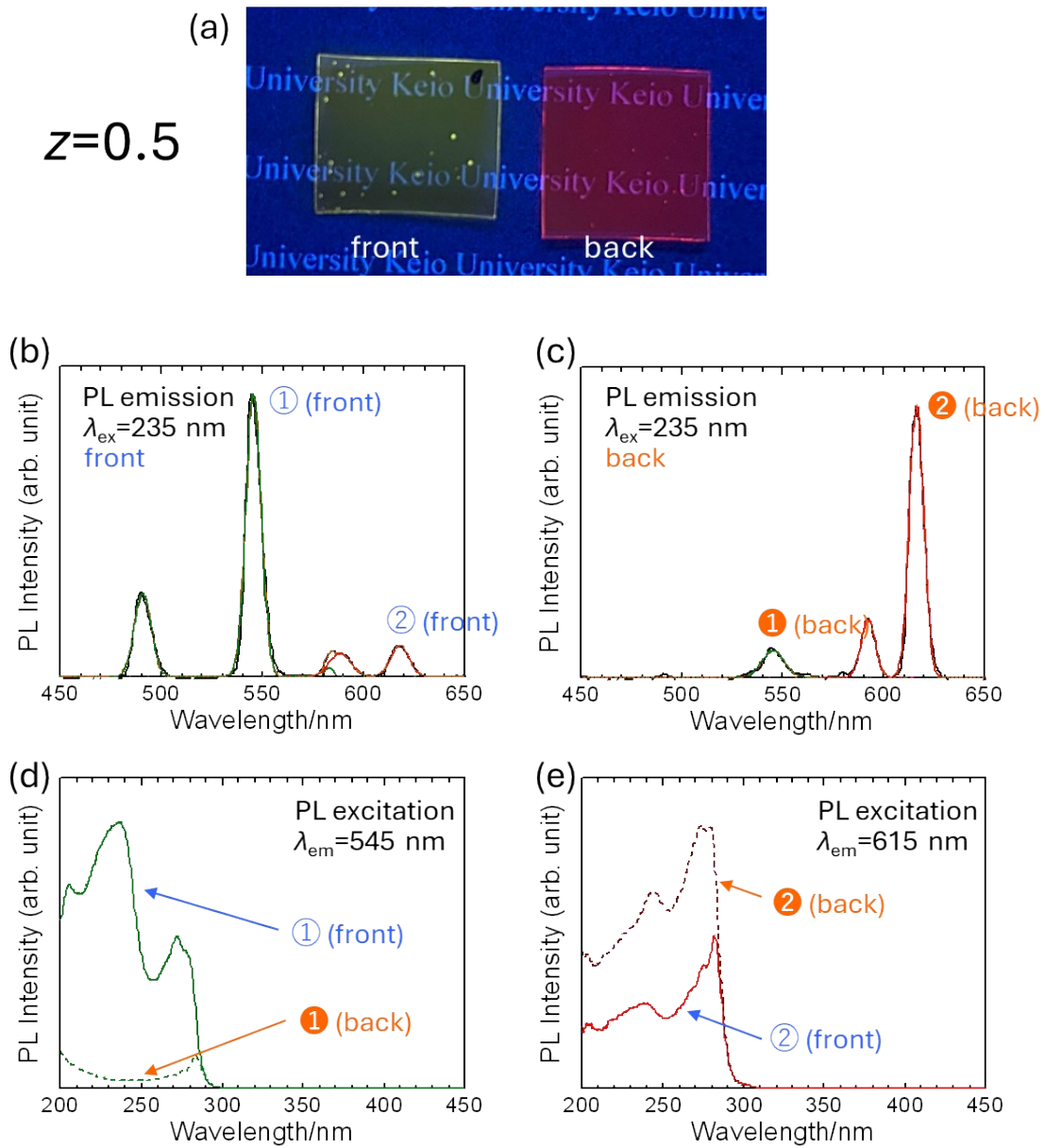
**Fig. S4** Cross-sectional TEM images of the PVA/LDH(B)Tb film in different magnifications.



**Fig. S5** (a) Photos (identical to those shown in Fig. 9d) of the self-standing film with  $z=0.1$  taken from both front and back side under the 254-nm UV lamp, PL<sub>em</sub> spectra recorded for (b) the front and (c) the back side of the film, and PL<sub>ex</sub> spectra for (d) the Tb<sup>3+</sup>, marked with ① and ①, and (e) the Eu<sup>3+</sup> emissions, ② and ②, from the front and the back of the film, respectively.



**Fig. S6** (a) Photos (identical to those shown in Fig. 9d) of the self-standing film with  $z=0.3$  taken from both front and back side under the 254-nm UV lamp, PL<sub>em</sub> spectra recorded for (b) the front and (c) the back side of the film, and PL<sub>ex</sub> spectra for (d) the Tb<sup>3+</sup>, marked with ① and ①, and (e) the Eu<sup>3+</sup> emissions, ② and ②, from the front and the back of the film, respectively.



**Fig. S7** (a) Photos (identical to those shown in Fig. 9d) of the self-standing film with  $z=0.5$  taken from both front and back side under the 254-nm UV lamp, PL<sub>em</sub> spectra recorded for (b) the front and (c) the back side of the film, and PL<sub>ex</sub> spectra for (d) the Tb<sup>3+</sup>, marked with ① and ①, and (e) the Eu<sup>3+</sup> emissions, ② and ②, from the front and the back of the film, respectively.