

Electronic Supplementary Information for:

Title: Kinetic Characteristics of Enhanced Photochromism in Tungsten Oxide Nanocolloid Adsorbed on Cellulose Substrates, Studied by Total Internal Reflection Raman Spectroscopy.

Authors: Kenta ADACHI ^{1*}, Tomohiro MITA ¹, Shohei TANAKA ¹, Kensuke HONDA ¹,
Suzuko YAMAZAKI ¹, Masaharu NAKAYAMA ², Takeyoshi GOTO ^{3†}, Hitoshi WATARAI ³.

- (1) Department of Environmental Science & Engineering, Graduate School of Science & Engineering, Yamaguchi University, Yamaguchi, 753-8512, Japan.
 - (2) Department of Material Chemistry, Graduate School of Science & Engineering, Yamaguchi University, Ube, Yamaguchi, 755-8611, Japan.
 - (3) Department of Chemistry, Graduate School of Science, Osaka University, Toyonaka, Osaka, 560-0043, Japan.
- † Present address : Nondestructive Evaluation Laboratory, Analytical Science Division, National Food Research Institute (NFRI), Tsukuba, Ibaraki, 305-8642, Japan.

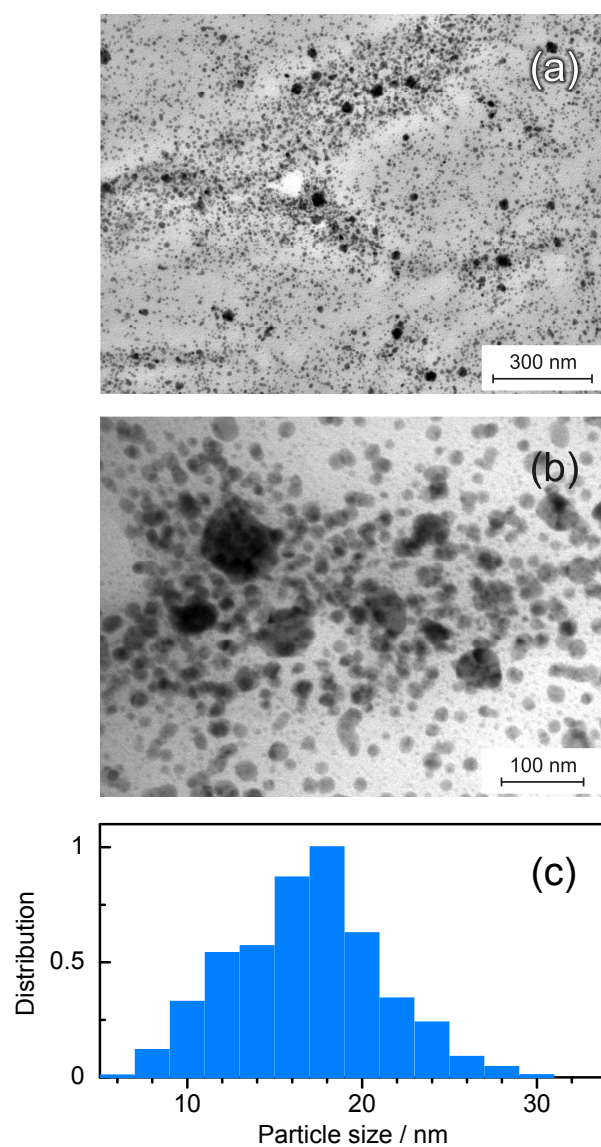


Figure S1 TEM image of the as-prepared WO_3 colloid. (a) low magnification ($\times 100,000$), (b) high magnification ($\times 500,000$). (c) corresponding WO_3 colloid particle size distribution histogram.

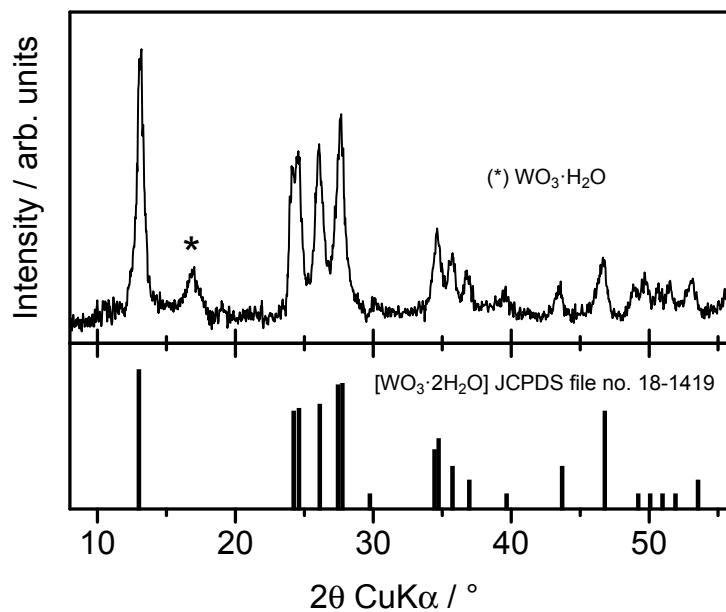


Figure S2 Powder XRD pattern of dried WO₃ colloids prepared in this study (which can be indexed to WO₃·2H₂O, JCPDS No. 18-1419, and the peak marked with (*) belongs to the 020 reflection of WO₃·H₂O, JCPDS No. 18-1418).

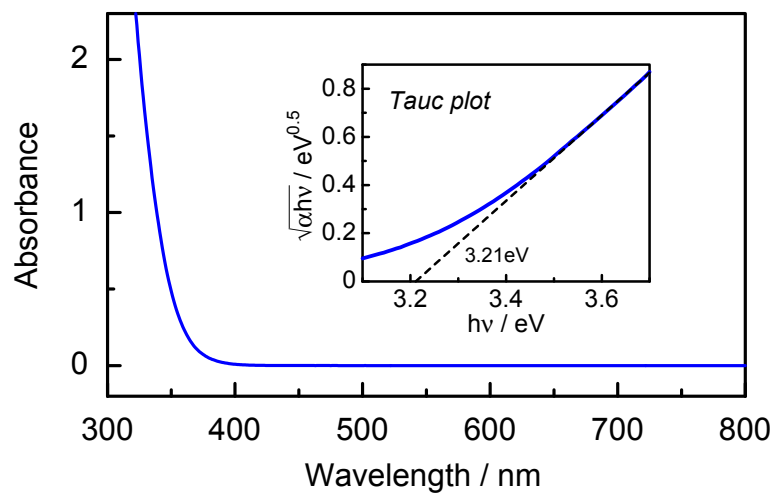


Figure S3 UV-Vis absorption spectrum of as-prepared WO₃ colloid solution. The inset shows the corresponding Tauc plot around the absorption edge for estimating the optical band gap energy.

Table S1 Assignments for vibrational Raman bands for CE and TACE. [Ref. S1]

Raman shift / cm^{-1}		Assignment
CE	TACE	
1150	1158	$\nu(\text{C-C})$ ring breathing, asymmetric stretching
1122	1125	$\nu(\text{C-O-C})$ glycosidic link, symmetric; $\nu(\text{C-O-C})$ ring
1095	1085	$\nu(\text{C-O-C})$ glycosidic link, asymmetric stretching
	911	$\nu(\text{C-(C=O)})$ symmetric stretching (evidence of acetate)
901		$\nu(\text{C-O-C})$ in-plane, symmetric
	841	$\nu(\text{C-CH}_3)$ stretching (evidence of acetate)
	659	$\delta(\text{O-C=O})$ in-plane deformation (evidence of acetate)
519	515	$\delta(\text{C-O-C})$ glycosidic link
459		$\delta(\text{C-C-O})$ ring deformation
435	431	$\delta(\text{C-C-O})$ ring deformation
381	383	$\delta(\text{C-C-C})$ ring deformation

Reference

- [S1] Socrates, G. *Infrared and Raman Characteristic Group Frequencies: Tables and Charts* (3rd Edition), John Wiley & Sons, New York, USA. (2001).