

# Measurement of photocatalytic efficiency of single Au/TiO<sub>2</sub> core-shell nanowires using dark-field scattering spectroscopy

Jubok Lee<sup>a,b</sup>, Seonhee Lee<sup>b</sup>, Min Su Kim<sup>a</sup>, Seki Park<sup>a,b</sup>, Yongjun Lee<sup>a,b</sup>, Hyunjung Shin<sup>b</sup>, and Jeongyong Kim<sup>a,b,\*</sup>

<sup>a</sup>Center for Integrated Nanostructure Physics (CINAP), Institute for Basic Science (IBS), Sungkyunkwan University, Suwon 440-746, Republic of Korea

<sup>b</sup>Department of Energy Science, Sungkyunkwan University, Suwon 440-746, Republic of Korea

[\\*E-mail: j.kim@skku.edu](mailto:j.kim@skku.edu)

## Abstract

A wide and indirect band-gap semiconductor, titanium dioxide (TiO<sub>2</sub>), has been applied to many potential applications such as dye sensitized solar cells, photocatalysts, photodetectors and gas sensors due to its excellent photoelectrochemical properties. Recently, metal-hybridized nanostructures of TiO<sub>2</sub> have been reported to have better photocatalytic efficiency due to surface plasmon resonance of metal nanostructures [1]. However, a systematic study of optical properties of Au/TiO<sub>2</sub> core-shell nanowires are rarely performed and direct estimation of photocatalytic capability in single nanowires are not reported.

In this study, we investigated dark-field scattering spectra of single strand of Au/TiO<sub>2</sub> core-shell nanowires using confocal microscope system. Dark-field scattering spectra obtained from single strands of Au/TiO<sub>2</sub> core-shell nanowires showed the enhancement of scattering efficiency with Au hybridization in total magnitude and spectral coverage. The enhancement of scattering efficiency was quantitatively consistent with measurement of photocatalytic effect using AO7 (acid orange 7 = C<sub>16</sub>H<sub>12</sub>N<sub>2</sub>O<sub>4</sub>S) solution. Finite-difference time domain simulations were also performed to compare with the experimental results.

## References

[1] D. Tsukamoto et al. J. Am. Chem. Soc. 134, 6309–6315 (2012).

## Figures