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## Diffusion Behavior of Ag in TiO<sub>2</sub> nanofilms

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### Highlights

- we prepared Ag/TiO<sub>2</sub> bilayer nanofilms and heat treatment at 400 °C lead to the formation of Ag nanoparticles, which evenly distributed inside TiO<sub>2</sub> nanofilms.
- Ag is not oxidized during the heat treatment.
- the morphology and size of Ag nanoparticles after heat treatment is temperature related, higher temperature lead to larger Ag nanoparticles on the surface of the film.
- the diffusion process is of Ag much easier in amorphous than in anatase structure.

### Abstract

Using magnetron sputtering, Ag/TiO<sub>2</sub> bilayer nanofilms were deposited on glass substrates. Heat-treating the Ag/TiO<sub>2</sub> nanofilms at 400 °C led to the formation of Ag nanoparticles, which dispersed inside the TiO<sub>2</sub> films as well as the free surface of the TiO<sub>2</sub> films. After heat treatment the sample at 500 °C, larger Ag nanoparticles could be observed on the surface, which means the particle size after heat treatment is temperature related. Anatase TiO<sub>2</sub> phase was formed after the Ag/TiO<sub>2</sub> films were heat-treated at 400 °C. SEM and TEM were used to investigate the morphology and structure of the films and it was found that Ag was not oxidized during heat treatment. The diffusion process of Ag in TiO<sub>2</sub> film is also related to the order of Ag layer

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