Titania-functionalized diatom frustules as photocatalysts for indoor air purification

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Diatoms are single-celled algae, which produce a porous silica skeleton. These so-called frustules can take on a large variation of shapes and sizes. In this study, the \textit{Thalassiosira Pseusonana} algae species was selected and its frustules were functionalized with titania nanoparticles. The synthesis method used was an impregnation with titanyl sulfate (TiOSO\textsubscript{4}) in water, which makes the procedure more environmentally friendly than when using the more common titanium alkoxides or chlorides. The immobilized titania nanoparticles could be visualized by TEM measurements, which showed that the NP are well dispersed on the silica surface (Figure 1).

![TEM images](image1)

Figure 1. TEM images of the optimized titania functionalized frustules.

The samples were used as photocatalyst in the oxidative decomposition of gaseous acetaldehyde, which is a common indoor air pollutant. The titania nanoparticles immobilized on the diatom frustules were 2.5 times more active than P25, which is the most common titania benchmark in photocatalysis. The titania-functionalized frustules also performed well in humid conditions and over a prolonged period of time, which are both important factors to consider for applications in indoor air pollution.