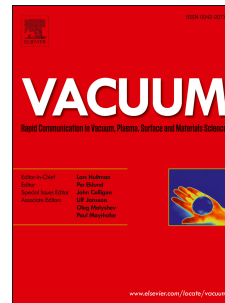


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# Development of Polyurethane based anti-scratch and anti-algal coating formulation with silica-titania core-shell nanoparticles

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## Abstract

In this present study, anti-scratch and anti-algal coating formulations were developed with silica and silica-titania core-shell nanoparticles individually in polyurethane binder. This core-shell nanoparticle was synthesized in house to utilize the mechanical property of core silica and photo-catalytic activity of thin titania shell on silica core. High mechanical property of silica improves the strength and anti-scratch property of polyurethane film whereas photo-catalytic activity of titania provides anti-algal property of the film. Silica nanoparticles were prepared through sol-gel process. TiO<sub>2</sub> nanoparticles and core-shell nanoparticles were prepared through peptization process. The prepared nanoparticles – silica, titania and silica-titania core-shell nanoparticles were characterized by Dynamic light scattering, UV-visible spectrophotometer, scanning electron microscopy, FTIR and X-Ray Diffraction. Polyurethane coating formulations were developed with polyurethane binder, thinner and above prepared nanoparticles, where percentage of nanoparticles were kept at 4 wt% of total formulation. Dry films were casted on glass substrate with these coating formulations after applying with brush and heated at 100° C. Scratch testing were carried out for these dried films with dry film thickness of 100 µm on glass substrate at different load from 3N to 9N. The same coating formulations were applied on small pieces of bricks for anti-algal testing against green algae and mixed algae. This core-shell formulation successfully improved the scratch resistance of coatings up-to 5N load and also provided good anti-algal property.

**Keywords:** SiO<sub>2</sub> nanoparticle, TiO<sub>2</sub> nanoparticle, silica-titania core-shell nanoparticle, nano-coating, polyurethane, scratch test, SEM, green and mixed algae.

## Introduction:

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