

3.3.3 Concept Development for Textile Wastewater Treatment in Vietnam using Photocatalytic Oxidation with Titanium Dioxide Nanoparticles (NaViTex)

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• Project Period: 09.2012 - 08.2015



Figure 1: Activated sludge in the wastewater treatment plant of a textile company in Da Nang, Picture: Nguyen Minh Tan

1. Project Background

Effluents from textile plants are highly toxic and hard to treat by conventional wastewater treatment plants. Since a couple of years, Vietnam is one of the fastest growing countries. A perceptible part of the growth is arising from the textile and garment industry. Wastewater from textile plants is one of the major sources of environmental problems.

2. Objectives

The goal of the joint research project is to create partnerships in research, development and implementation in a major field of wastewater treatment, in which modern materials and methods from nanotechnology for the decontamination of dye-contaminated wastewater will be developed and tailored to the conditions in Vietnam. A valid concept to treat wastewater from plants of the textile industry will be given. One central point is the destruction of effluent dyes with the aid of the photocatalytic process with titanium dioxide and sunlight or extra irradiation units. The overall scope of the

cooperation should be the development of a nano-technology-based concept to be efficiently applied to wastewater treatment in developing countries.



Figure 2: In the wastewater treatment plant, Picture: Nguyen Minh Tan



Figure 3: Partners, friends and stakeholders, Picture: Nguyen Minh Tan



Figure 4: German-Vietnamese Workshop concerning wastewater treatment, Picture: Nguyen Minh Tan

3. Main Project Tasks

The main tasks of NaViTex-Project are:

- Development of a photocatalyst starting with titanium dioxide on the nanoscale. The photocatalyst should be more sensible towards those parts of the spectrum with longer wavelengths (the so-called UVA/VIS region). This would be followed by a more efficient use of the applied energy;

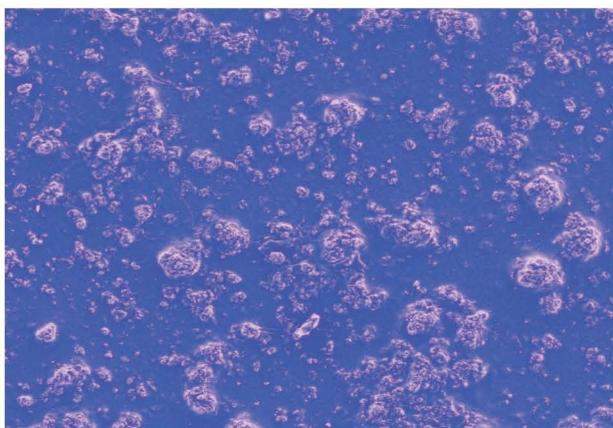


Figure 5: Surface of a photocatalyst inspected by Scattering Elektron Mikroskopy, Picture: Klaus Kühn

- Development of a technology of coating and of surface structures which show a high photocatalytical activity and pronounced mechanical stability;
- Development of a photoreactor which shows an efficient use of sunlight and those parts of artificial light sources not applied so far.

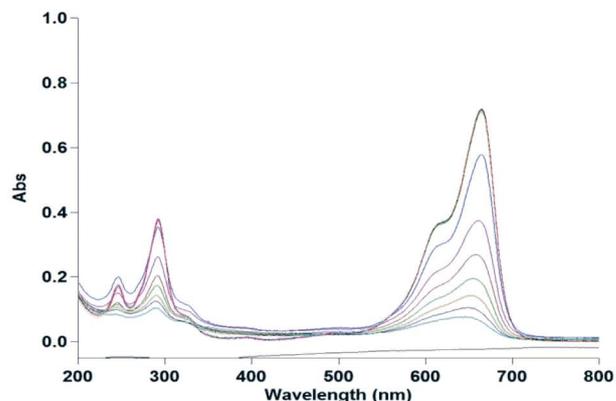


Figure 6: Photocatalytical destruction of a dye during 30 minutes, Source: Klaus Kühn

Additionally, comprehensive project tasks are:

- Development of a sustainable and energy efficient treatment concept which is suited to be adopted by other tropical regions;



Figure 7: Ha Long Bay, Picture: Klaus Kühn

- Effective transfer of state-of-the-art technology towards developing countries like Vietnam for environmental protection;
- Development of this treatment concept to production standard and marketing by the German industrial partner.

4. Important Results Obtained to Date

Over the next three years, a valid concept for wastewater treatment using nanoscale photocatalysts and sunlight as an energy source will be developed in Dresden and Hanoi and afterwards tested in pilot plants in Vietnam where they are adapted to the local requirements of practical operation.



Figure 8: Some of the partners in the wastewater treatment plant, Picture: Klaus Köhn

This new energy- and material-efficient method has a wide range of possible applications. Especially in developing and emerging countries where decentralized solutions for wastewater treatment are expected to have a huge market potential the consortium has already developed extensive marketing strategies.



Figure 9: Temple in Hue, Picture: Klaus Köhn

5. Project Area in Vietnam

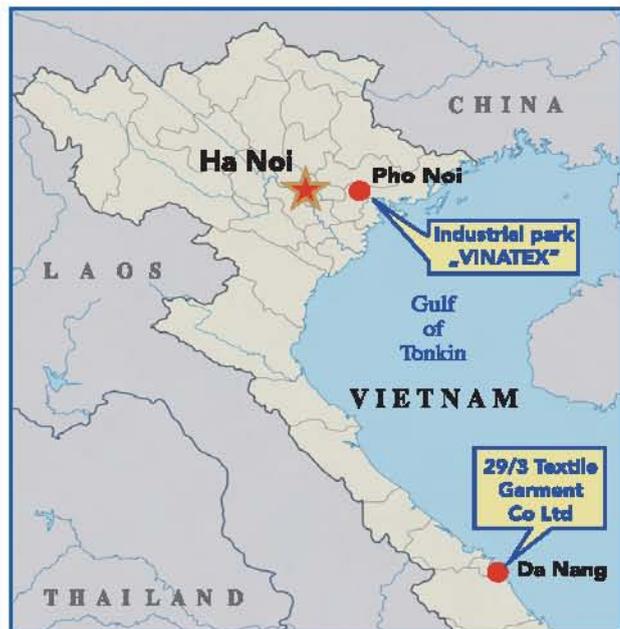


Figure 10: Locations for the planned degradation experiments, Source: IEEM

German Partners

- Technische Universität Dresden (TUD), Institute for Materials Science and Max Bergmann Center of Biomaterials, Chair for Materials Science and Nanotechnology
- Gesellschaft zur Förderung von Medizin-, Bio- und Umwelttechnologien e.V. (GMBU), Innovative Bio-, Medical- and Environmental Technologies (GMBU), Functional Coatings, Dresden
- UMEX GmbH, Dresden

Vietnamese Partners

- Hanoi University of Science and Technology (HUST), Institute for Research & Development of Natural Products (INAPRO)
- Department of Science and Technology Da Nang City (DOST)

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