

## ***Abstract.***

The objective of present thesis is to prepare and evaluate photocatalyst for hydrogen generation from water methanol mixture using solar light.

This general objective has been accomplished by applying different methodology in material preparation as well as exploring the photocatalytic activity of novel semiconductors.

In this way after a general introduction to the field showing the relevance of solar fuels and in particular hydrogen generation, the focus of chapter 3 is, on the other hand, to optimize the nature of the cocatalyst based on noble metals. In this way Au-Pt alloy nanoparticles with different composition will be deposited on p25 and their activity correlated with the irradiation wavelength and nature of the alloy.

In chapter 4 and 5 we evaluate the photocatalytic activity of materials derived from titanate nanotubes either by hydrogen annealing at various temperatures (chapter 4) or by forming heterojunction with a combination of titania nanoparticles (chapter 5).

The two final chapters of this thesis report the semiconductor behaviour and the photocatalytic activity of framework phosphate either mixed valence titanium III/IV (chapter 6) or iron (chapter 7) doped with various metals.

The overall results achieved show that it is possible to increase the photocatalytic activity of titanium-based materials by applying concepts like control of morphology, amorphization of surface of particles, formation of heterojunction and control of the cocatalyst. We have also shown that besides oxide, framework phosphate can also be valuable as photocatalysts.

