Chemical and photo reduction of Au on TiO_2 via deposition-precipitation method

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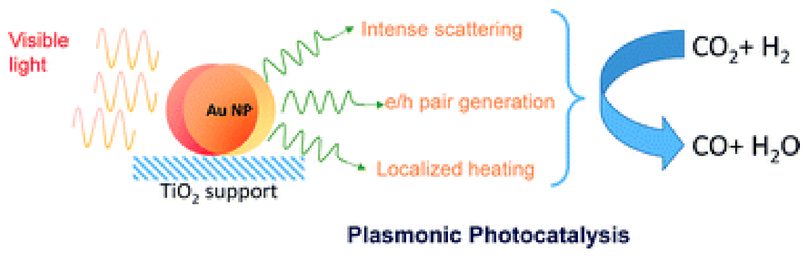
SPOTLIGHT
Sunlight Production of Chemical Fuels

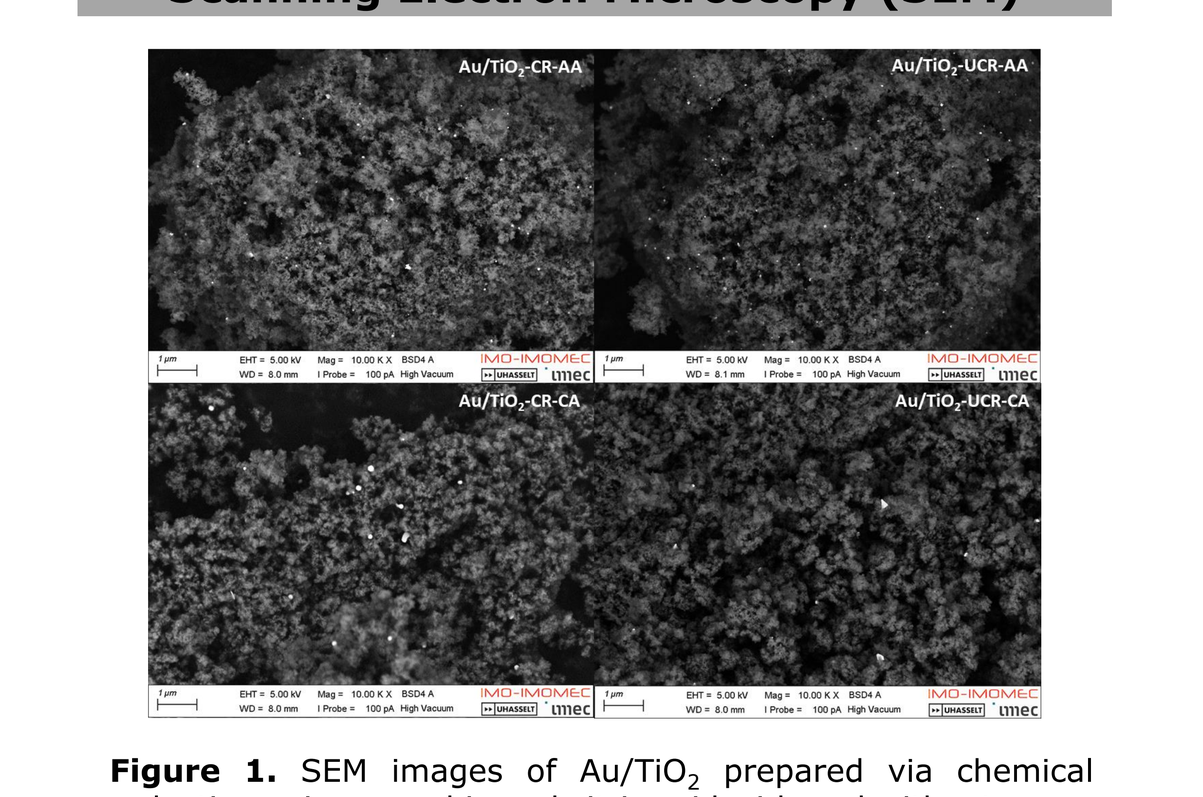
Introduction

- Gold (Au) supported TiO_2 catalysts are extensively studied in many catalytic reactions because of its optical and catalytic properties
- The catalytic activity and optical properties of Au/TiO_2 depends on factors such as dispersion, particle size and Au loading
- Using deposition precipitation method, Au/TiO_2 catalyst with higher Au loading and homogeneous dispersion can be synthesized
- Reaction conditions such as temperature, pH, precipitating agent (NaOH or Urea), heat treatment have an influence on dispersion and Au loading
- Here, we have developed a chemical and photo reduction of Au on TiO_2 via a deposition precipitation method using different reducing agents.



Plasmonic Photocatalysis

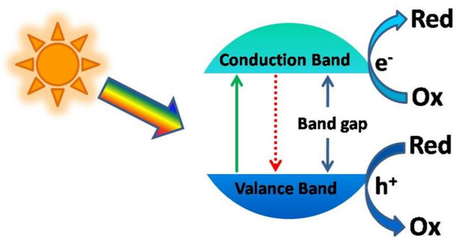
Deposition-precipitation using Urea



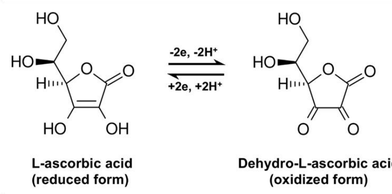
*UV light irradiation (254 nm) was performed at room temperature

Sample code	Calculated Au wt%	Measured Au wt% (ICP-OES)
Au/TiO_2-CR-AA	2	1.87
Au/TiO_2-CR-CA	2	1.91
Au/TiO_2-UCR-AA	2	1.92
Au/TiO_2-UCR-CA	2	1.71
Au/TiO_2-PR-AA	2	1.95
Au/TiO_2-PR-CA	2	1.00
Au/TiO_2-UPR-AA	2	1.79
Au/TiO_2-UPR-CA	2	1.65

CR – Chemical reduction, PR – Photo reduction, U – addition of Urea, AA – Ascorbic acid, CA – Citric acid



$Au^{3+} + 3\,e^- \rightarrow Au$ SHE = 1,40 V



Scanning Electron Microscopy (SEM)

Figure 1. SEM images of Au/TiO_2 prepared via chemical reduction using ascorbic and citric acid with and without urea

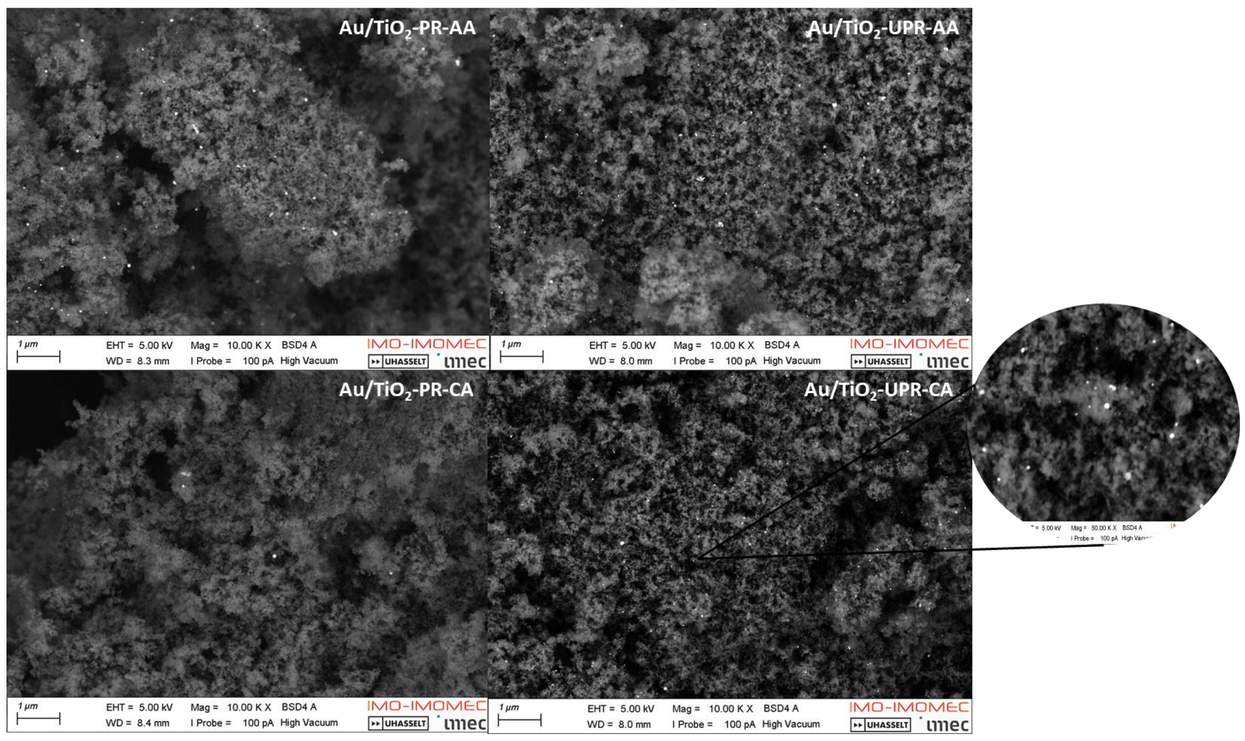


Figure 2. SEM images of Au/TiO_2 prepared via photo reduction using ascorbic and citric acid with and without urea

UV-vis spectroscopy

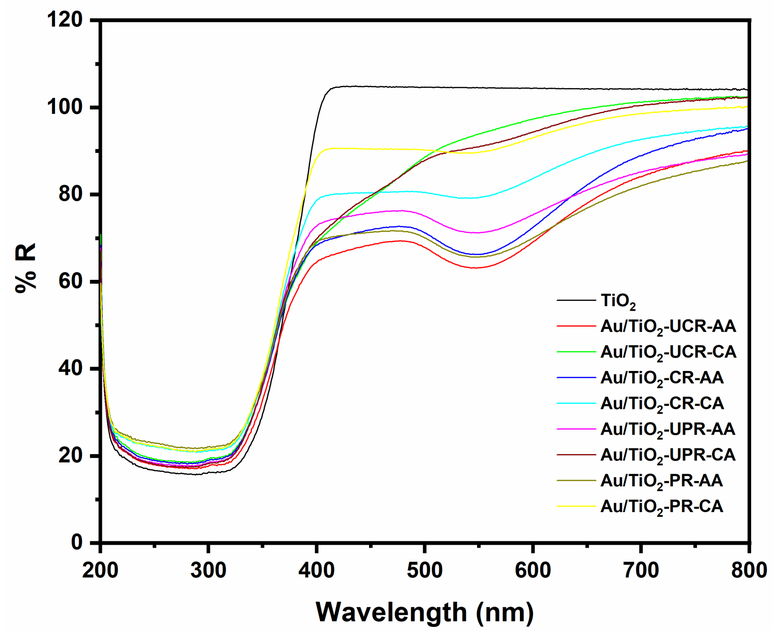


Figure 3. UV-vis spectroscopy of Au/TiO_2 synthesized via chemical and photo reduction using ascorbic and citric acid with and without urea

Conclusion

- Homogeneous dispersion and higher Au loading was achieved via chemical and photo reduction using ascorbic acid
- Addition of urea improves dispersion and Au loading compared to samples without urea
- Au/TiO_2 synthesized via chemical and photo reduction using ascorbic acid with and without urea absorbs light in the visible light region

References

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Acknowledgement

The authors acknowledges An-Sofie Kelchtermans for ICP-OES measurement

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