

SUPPORTING INFORMATION

Highly Crystalline Nanoparticle Suspensions for Low Temperature Processing of TiO₂ Thin Films

Jonathan Watté, Petra Lommens, Glenn Pollefeyt, Mieke Meire, Klaartje De Buysser, Isabel Van Driessche*

SCRiPTS, Department of Inorganic and Physical Chemistry, Ghent University, Krijgslaan 281-S3, 9000 Gent, Belgium

An overview of the composition of the synthesized titanium ion precursors by using different bases and molar ratios (Table SI-1).

Name	Base (B)	Ti: H ₂ O ₂ : IDA : B	pH
Ti-EA	EA	1 : 2 : 2 : 2	3.20
Ti-TEAOH	TEAOH	1 : 2 : 2 : 1	4.00

Table SI-1. Stable titanium precursor solutions with different bases and molar ratios to titanium.

TGA Analysis of precipitated nano-sized powders from Ti-EA and Ti-TEAOH suspensions

A comparable thermal decomposition behavior is seen for precipitated powders from both Ti-TEAOH and Ti-EA nanoparticle suspensions under air (Fig. SI-1). The weight loss below 250°C can be attributed to the vaporization of water and either TEAOH or ethanolamine¹. For the Ti-TEAOH suspension microwaved at 140°C for 60 minutes, the weight loss is less when compared to microwaved suspensions for 10 or 30 minutes. This can be attributed to the decomposition of TEAOH during a prolonged microwave irradiation time. The same trend

can be observed with Ti-EA powders, in which longer MW reaction times result in less weight loss due to a larger amount of decomposition of ethanolamine during prolonged microwave reaction times. The second weight loss between 250 and 500 °C is caused by the decomposition of free ethanolamine, and the decarboxylation of free carboxylic acid¹. In general, it can be stated that prolonged MW irradiation times of the Ti-precursor result in less weight loss in the nanosuspension due to a smaller amount of unreacted species inside these suspensions.

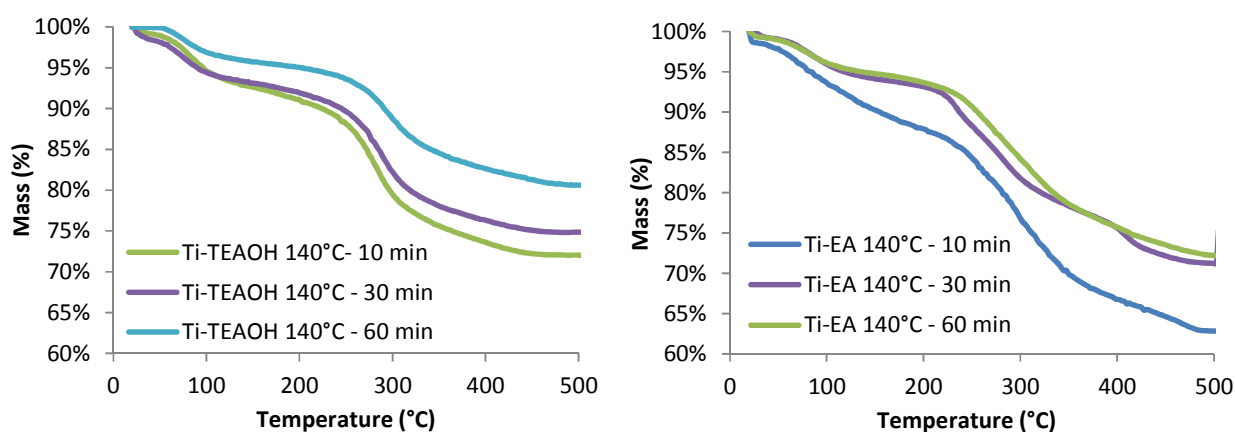


Figure SI-1. TGA powder analysis of the Ti-TEAOH (left) and Ti-EA (right) nano-sized powders from nanoparticle suspensions (pH = 3.5) performed in flowing air with a heating rate of 10 °C/min.

REFERENCES

1. Pollefeyt, G.; Clerick, S.; Vermeir, P.; Lommens, P.; De Buysser, K.; Van Driessche, I., Influence of Aqueous Precursor Chemistry on the Growth Process of Epitaxial SrTiO₃ Buffer Layers. *Inorg. Chem.* **2014**, 53, 4913-4921.