

10th ISE Satellite Student Regional Symposium on Electrochemistry

2nd July 2021, online event

BOOK OF ABSTRACTS



10th ISE - SRSE

Croatian Society of Chemical Engineers

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A NOVEL APPROACH FOR THE STUDY OF THE KINETICS OF SOL-GEL SYNTHESIS OF TITANIUM DIOXIDE NANOPARTICLES AS CATALYST SUPPORT

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Owing to a wide range of application in kinetics (photocatalysis, electrocatalysis, etc.), it is of high importance to define in details correlation between structure and synthesis of TiO₂ particles. The aim is to elucidate the kinetics of TiO₂ solid phase formation by sol-gel approach as newly-structured suitable carrier of batteries/fuel cells electrocatalytic materials.

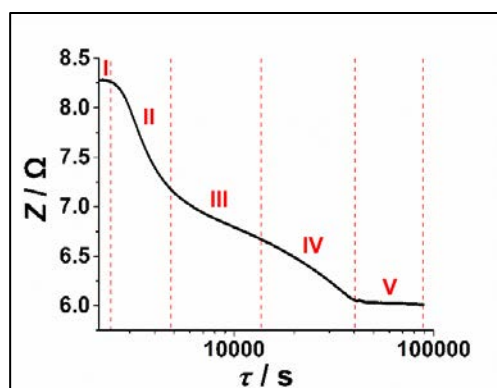


Figure 1. The typical change of high frequency impedance of a synthesis medium during TiO₂ solid phase formation. Conditions: $c(\text{TiCl}_3) = 0.022 \text{ mol dm}^{-3}$, $c(\text{HCl}) = 0.077 \text{ mol dm}^{-3}$, $t = 50 \text{ }^\circ\text{C}$.

TiO₂ nanoparticles were synthesized from TiCl₃ precursor under different conditions (concentration, pH) in an aqueous medium. Formation of a new solid phase was continuously monitored by a dynamic conductometric measurements induced by high frequency impedance sinusoidal voltage perturbations of a conductometric cell. The particle size distributions of the obtained TiO₂ sols were characterized by the dynamic light scattering method, while the microstructure data were obtained by the scanning electron microscopy. The typical change of high frequency impedance during TiO₂ synthesis is presented in Figure 1. It was found that the process proceeds through at least five phases (I–V, Figure 1, seen as high frequency impedance decrease) of different rates and durability, which depend on synthesis conditions.