

# The Influence of Tribophysical Activation on $Zn_2TiO_4$ Synthesis

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## Abstract

The influence of mechanical activation on  $Zn_2TiO_4$  synthesis along with the changes within powders during tribophysical treatment was observed. Mixtures of ZnO and  $TiO_2$  powders were mechanically activated using high-energy ball mill during different time intervals from 0 to 300 minutes. XRD was performed in order to give information about phase composition varieties. Microstructure parameters were revealed from approximation method. Particle size distribution along with scanning electron microscopy gave very useful information about powder morphology.

Tab. 1. Microstructure parametare of ZTO-000 and ZTO-030 revealed from approximation method

mill. time	phase comp.	D (nm)				$\rho_D \cdot 10^{12} \text{ (cm}^{-2}\text{)}$				$\phi_{\text{Hkl}} \cdot 10^3$			
		(100)	(002)	(101)	(110)	(100)	(002)	(101)	(110)	(100)	(002)	(101)	(110)
0	ZnO	69.1	69.6	139.8		0.063	0.062	0.015		1.8	1.7	0.8	
	a- $TiO_2$			51.1				0.1				3.1	
	r- $TiO_2$				82.1				0.044				1.8
30	ZnO	17.4	52.4	34.9		0.9	0.1	0.3		6.7	2.1	3.2	
	a- $TiO_2$			68.1				0.065				2.3	
	r- $TiO_2$				41.1				0.2				3.6

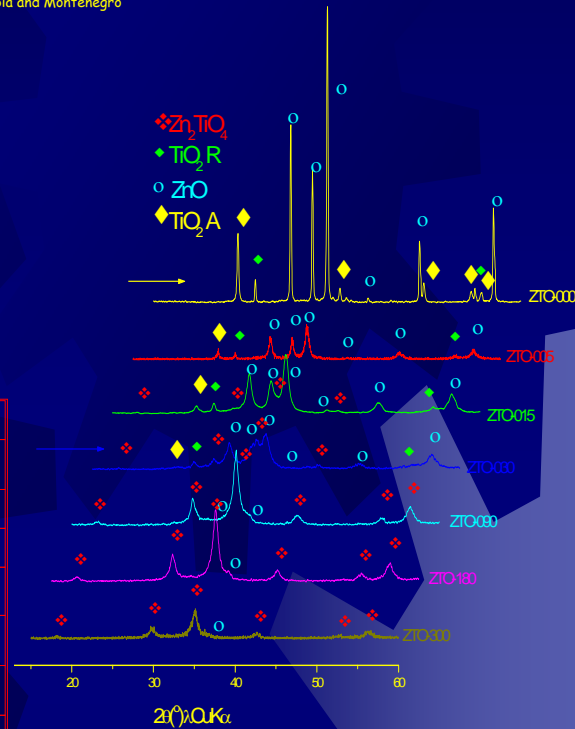
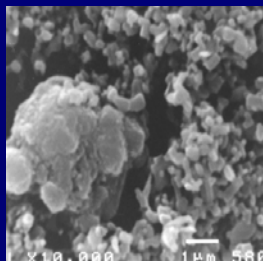
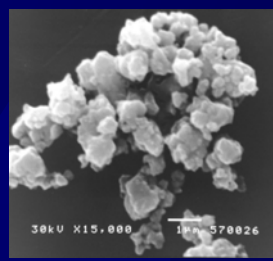


Fig. 1. X-ray diffraction patterns of unmilled and milled ZnO and  $TiO_2$  powder mixtures



ZTO-000



ZTO-030

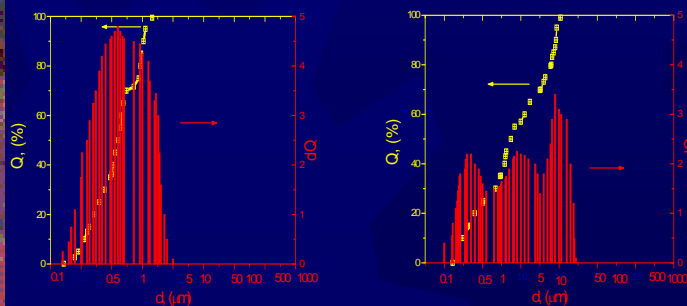


Fig. 2. SEM and particle size distribution of ZTO-000 and ZTO-030

## Conclusions

In this paper the influence of tribophysical activation on  $Zn_2TiO_4$  synthesis was studied. Based on these results, the first significant appearance of zinc titanate phase along with all the starting phases is established to be after 30 minutes of mechanical treatment although the very first diffraction peaks are detectable after 15 minutes of tribophysical activation. Also, we found that tribophysical activation leads to particle size reduction, the increase of dislocation density and lattice strain. It is well known that the appearance and the increase of defects within observed material leads to better diffusion and accelerates the solid-state reaction. Scanning electron micrographs along with the particle size distribution indicate the difference between non-activated and activated samples morphology and in such a way confirm the changes going on during mechanical activation.

## Acknowledgement

This research was performed within the project No. 1832 entitled "Synthesis of functional materials from the 'synthesis-structure-properties-application' relationship", financed by the Ministry for Science and Environmental Protection of the Republic of Serbia. Authors would like to express their gratitude to Prof. S. Djuric for X-ray measurements.