

Shape and Size Controlled ZnO Particles and Their Cytotoxic Behaviour

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ZnO particles are used in the cosmetic industry especially for their absorption ability of UVA and UVB lights that are harmful for human skin [1]. Moreover the size of particles go down to nano size, they gain a transparent and aesthetic appearance. Due to these properties, ZnO nanoparticles are promising materials for the sunscreen applications [2]. However ZnO particles can penetrate from the human skin when they have a nano size. Therefore synthesized ZnO nanoparticles with shape and size controlled as reducing their nanotoxicological effect is prerequisite. The objective of this study is to produce nano primer micron plate like shaped ZnO particles by solvothermal route and also investigate the toxicological behaviour on the cell. ZnO was used as zinc source (ZnO, Merck) and glycerol as a solvent (C₃H₈O₃, Detsan) were used for the synthesis. Calcined particles and Zn-Organic complex were characterized with scanning electron microscopy (SEM, Zeiss Evo) , x-ray diffractometer (XRD, Rigaku). Phase transformation between ZnO and Zn-Organic complex were observed from the XRD patterns. The nano primer hexagonal shaped micron plates of ZnO has a size ranging from 2 to 10 µm ,that was seen from the SEM images. As a result, Zn-Organic complex with nano primer hexagonal micron plate shape can be synthesized at 260°C for an hour , and ZnO structure can be formed with calcination. Finally, the toxicological behaviour of ZnO particles on TIG 114 (human skin fibroblast) cell was investigated with plate like and precursor particles comparatively. Cytotoxicity was determined by MTT (3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyl tetrazolium bromide) assay. TIG 114 cells were treated with 0, 1.25, 2.5, 5, 10, 20, 40, 50, 80, 100 and 200 µg/ml ZnO nanoparticles in media for 24 hours. The results showed that precursor ZnO nanoparticles exhibited a significant effect on the viability of TIG 114 cells depend on concentrations. ZnO plate did not induced cytotoxicity at lower concentrations (range of 1.25 - 40 µg/ml), cytotoxic effect was observed at higher concentrations (50, 80, 100 and 200 µg/ml). Consequently the use of plate like shaped ZnO particles were thought that precaution for penetrating the human skin and also protection against the UV lights with aesthetic appearance.

Acknowledgements

The financial support for this study from The Scientific and Technological Research Council of Turkey (TUBITAK) (Project Number: 109M585) and Anadolu University Scientific Research Projects Commission (Project Number : 1101F020) was gratefully acknowledged.

References

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Figure 1. SEM images of nano primer hexagonal micron plate shaped ZnO a) before calcination (Zn-Organic Complex), b) after calcination.

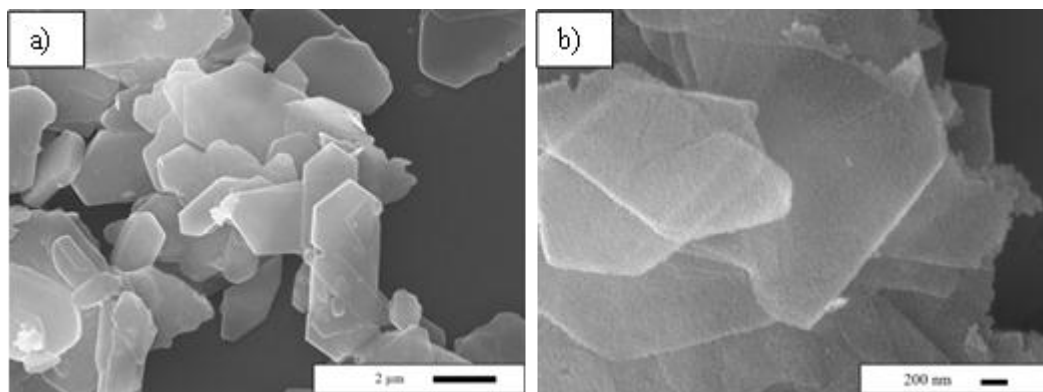


Figure 2. XRD patterns of a) Zn-Organic Complex and b) ZnO after calcination occurs at 350°C

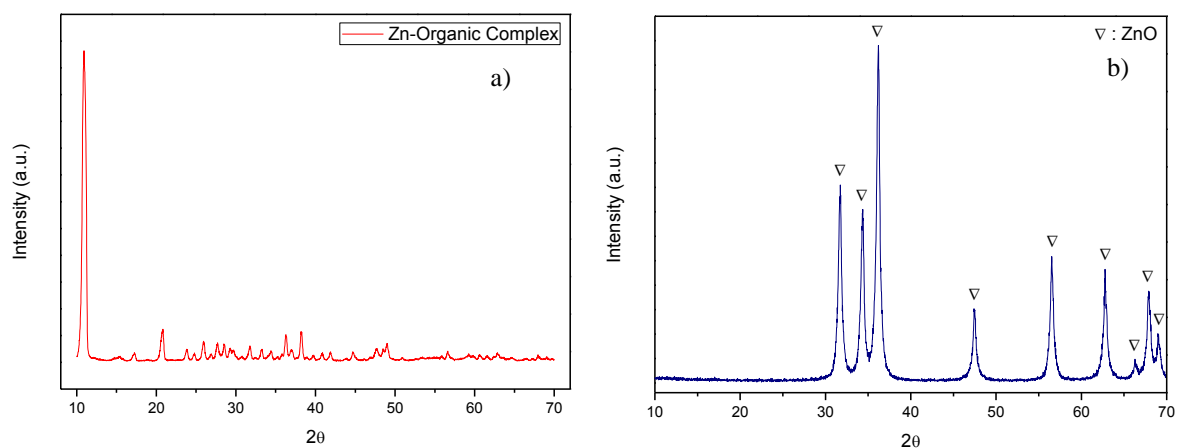


Figure 3. Dose dependent Cytotoxic behavior of precursor ZnO and synthesized ZnO plate on TIG-114 cells.

