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Ing Vijay Bijalwan – Supervisor's Opinion on Thesis

Ing. Vijay Bijalwan graduated in Nanoscience and Technology from the School of Engineering and Technology, Sharda University, India in 2012. He worked in Graphic Era Hill University, Dehradun India, as a lecturer until October 2014. In November 2014, he joined CEITEC, Brno university of Technology as a PhD student in the Department of Advanced Materials. As part of his work Ing. Vijay Bijalwan was concerned with a study of the synthesis and processing conditions on the structure and properties of (Ba, Ca) (Ti, Zr) O₃ lead free ceramics.

The main benefit of his work is to carry out a systematic investigation of the synthesis and processing conditions of lead free piezoelectric ceramic materials on the basis of existing issues, challenges and most recent status in the field of lead free piezoelectric ceramics. The optimization conditions (particle size, grain size, sintering temperature etc.) for the new (Ba, Ca) (Ti, Zr) O₃ ceramics were discovered when doped with CeO₂. The main findings are, the reduction in sintering temperature from 1540°C to 1350°C with minimal deterioration of its functional properties, optimisation of grain size (10-16µm), morphotropic phase boundary between (yCeO₂, y = 0 - 0.1 wt.%) and high piezoelectric constant d₃₃>500 pC/N. The crystal structure was studied with the help of X ray diffraction (XRD) and Raman spectroscopy when CeO₂ was used as a substitution at A site and B site of the (Ba, Ca) (Ti, Zr) O₃ perovskite structure. It is found that when CeO₂ was substituted at the A site, the functional properties including dielectric, ferroelectric and piezoelectric properties could be enhanced at low sintering temperature while when substituted at the B site, the properties may have deteriorated.

During his full time PhD study, besides his research activities, Ing. Vijay Bijalwan also devoted himself to train and guide bachelor students in CEITEC laboratory. He also participated in the GACR project "A fundamental study of the effect of synthesis and processing conditions on the structure and properties of (Ba, Ca) (Ti, Zr) O₃ lead-free piezoceramics", the CEITEC BUT internal project "Fabrication of Multi-Layer Actuators with Lead-free Piezoelectric Compositions" and an ongoing GACR project "Control of microstructure and properties of lead-free piezoceramic materials through advanced ceramic processing". During his second year, he attended a two weeks internship in University of Aveiro, Portugal and 6 months internship in University of Birmingham UK. He is co-author of 2 publications, another 3 publications are in communication of which he is the first author. One contribution was presented at international conference in Ireland.

In conclusion, Ing. Vijay Bijalwan gained a broad knowledge of the field in the course of doctoral studies, demonstrated the ability of independent scientific work and achieved a number of original results. I recommend that his dissertation be accepted for defense.

Yours sincerely

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