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Review of the habilitation thesis
of Dr. Lucjan Kozielski titled “Physical properties of materials for
multifunctional piezoelectric transformer”

The thesis of Dr. Kozielski deals with further development of the piezoelectric transformers as a multifunctional elements for the tentative transducer and sensor applications. It is focused on the energy conversion properties of the piezoelectric transformers and creation of the multifunctional structures for efficient detection of the magnetic field and light intensity, as well as for the energy harvesting.

The thesis includes theoretical, physical and technical basics of piezoelectric transformers and review of their classical piezoelectric and novel applications. The PZT-based piezoceramics are considered as an effective materials for piezoelectric transformers, their physical properties and technological features are described and analyzed. For the light and magnetic field detection, the optically and magnetically active PZT-based piezoelectric ceramic materials (PLZT, PZT-NZF, etc.) or multilayered piezoelectric-magnetostrictive structures are considered to be used. Processing and characterization peculiarities of the optically and magnetically active piezoelectric materials and multilayered piezo-magnetic structures are described with details. Finally, the thesis reports on original results of development, research and characterization of the piezoelectric transformers as light intensity transducers, magnetic field detectors and magnetic field harvesters.

Generally, the habilitation thesis of Dr. Kozielski provides a good impression. It is well structured and written in a good English. Its subject is actual and covers the less developed (but rather interesting and promising) areas of the piezoelectric materials application for the conversion/detection of the optical signals and magnetic fields to the electrical ones. The idea of multifunctional piezoelectric transformer utilizing various forms of energy conversion, some

approaches and results reported in the thesis are of interest for the Material Research and Piezoelectronics communities.

Well elaborated literature review, based on the extensive list of references, proves competence of Dr. Kozielski in the field and his analytical abilities. On my mind, the habilitation thesis could be interesting not only for specialists but also for students and used in the education process.

I found no essential drawbacks in the thesis calling for major changes. Even if the original results obtained by Dr. Kozielski do not solve all problems noted in the thesis, they could be useful for further development in the field. Therefore I consider that habilitation thesis of Dr. Kozielski **satisfies the applied requirements.**

I recommend the habilitation thesis for a public defense. After the successful defense, I **recommend to award the scientific-pedagogical title of docent** (associate professor) to Dr. Kozielski.

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