



**Instytut Fizyki**  
**Wydział Nauk Ścisłych i Przyrodniczych**  
**Uniwersytet Pedagogiczny im. Komisji Edukacji Narodowej w Krakowie**



Serdecznie zapraszamy na  
**SEMINARIUM IF-UP**

referat pt.

**“Disorder and short-range order in perovskite dielectric materials”**

Wygłosi

**dr Marek Paściak**

Department of Dielectrics, Institute of Physics,

Czech Academy of Sciences, Na Slovance 8, 182 21 Prague 8, Czech Republic.

Seminarium odbędzie się w piątek, **22 listopada 2019, o godz. 10:00**

w sali 514, główny budynek UP, ul. Podchorążych 2, 30-084 Kraków.

**Zapraszamy!**

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**Abstract:**

Introducing deviations to perfect crystalline order has been a well-established practice in material engineering. When it comes to advanced dielectric materials, chemical or substitutional disorder is often used to introduce local strain or charge imbalance. This leads to short to medium-range correlations and – in favourable cases – to greatly enhanced electromechanical properties. At the same time such partially disordered systems pose a great challenge for structural analysis in which standard methods are not suited to describing nanoscale correlations. There has been, however, a substantial effort in the recent years to develop ‘local structure’ methods based on diffuse scattering and pair distribution function analyses [1].

In this talk we will briefly introduce some basic concepts related to diffuse scattering and go through examples of how experimental results, together with atomistic simulations, can reveal structural peculiarities of some of the most used ferroelectric materials. We will start with the famous  $\text{BaTiO}_3$  and show that after decades of research the character of its paraelectric to ferroelectric phase transition can be still controversial [2].  $(\text{Sr},\text{Ba})\text{Nb}_2\text{O}_6$  tungsten bronze relaxor ferroelectric will serve as an example of rather serious entanglement of chemical disorder, polar short range correlation and other, non-polar instabilities leading to the incommensurate modulation [3]. Finally, the antiferroelectric  $\text{PbZrO}_3$  and its solid solutions will represent the world of Pb-based perovskites in which a great variety of polarization orders is observed.

[1] Keen & Goodwin, The crystallography of correlated disorder. Nature 521, 303 (2015),

[2] Paściak et al., Dynamic Displacement Disorder of Cubic  $\text{BaTiO}_3$ , Phys. Rev. Lett. 120, 167601 (2018).

[3] Paściak et al., Local structure of relaxor ferroelectric SBN from a pair distribution function analysis, Phys. Rev. B 99, 104102 (2019).