東京理科大学
TOKYO UNIVERSITY OF SCIENCE

第37回　物理工学科セミナー

日時：１１月２０日（金）１６:００－１７:００
場所：葛飾キャンパス研究棟８Ｆゼミ室１

Speaker ：　Prof. Ruy Alberto Pisani Altafim

Affiliation ：Department of Computer Systems, Informatics Center, Federal University of Paraíba - Brasil

Title ：　**Latest developments on piezoelectret and applications**

Abstract：

This presentation details the fundamental principles, evolution, and wide-ranging applications of piezoelectrets (ferroelectrets). Piezoelectrets convert mechanical stress into electrical voltage through charged porous or structured polymer films containing internal void spaces. The talk reviews established commercial and technical applications, including flexible energy-harvesting wear, acoustic transducers, hydrophones, biomimetic sensors, and non-destructive material inspection systems. It then traces the author's key research milestones since 2004, focusing on advanced fabrication techniques designed to control void geometry and improve performance:

- **Structural Innovation:** Transitioning from early foamed PP films up to multi-layer Teflon FEP/PTFE with template-based open tubular channels, unipolar single-layer systems, and thermo-formed water-filled pads.
- **Thermal & Discharge Stability:** Enhancing charge stability and temperature tolerance via chemical treatments (such as H_3PO_4 and $TiCl_4$) and optimized dielectric barrier discharge patterns.
- **Practical Implementations:** Demonstrating piezoresistive and capacitive sensors in acoustic partial-discharge detection for electrical power equipment, vibro-acoustography hydrophones, accelerometers, and low-pressure monitors. Finally, the presentation highlights recent developments in additive manufacturing (3D-printed ABS and polypropylene structures with engineered cavities) and emerging hybrid magnetic-piezoelectret transducers for current sensing, outlining a roadmap for future research in energy harvesting and advanced acoustic sensing.

世話人：**中嶋　宇史**