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信息功能材料与器件研究中心

Development of mechanoluminescence and multipiezo materials

报告人
Prof. Chao-Nan Xu

报告时间
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报告地点
嘉定园区G3第一会议室

Chao-Nan Xu serves as Chair Professor in the Department of Materials Processing in Tohoku University. From 2001 to present, Xu has served as the principal investigator in numerous programs, including JST-PRESTO, JST-CREST, SIP, and JSPS-KAKENHI. Her recent research has led to the discovery of a novel form of elasticoluminescence and the development of a hybrid inorganic/organic composite coating ("skins") for quantitative stress/strain and fault analysis. She holds over 200 patents (with more than 100 registered), has published over 250 papers, and has delivered more than 200 invited, plenary, and keynote talks. Xu has received numerous prestigious awards, including the Minister of Education, Culture, Sports, Science and Technology Award for Distinguished Researcher (Gold Medal), the Excellent Academic Achievements Award from the Japan Ceramic Society, and the Remarkable Innovation Award from the Science and Technology Minister. Prof. Xu is currently a member of the Engineering Academy of Japan.

邀请人:郑嘹赢 研究员　李国荣 研究员

欢迎感兴趣的老师和研究生参加！

Development of mechanoluminescence and multipiezo materials

The emergence of novel mechanoluminescent (ML) materials, such as $SrAl_2O_4$ and ZnS, which can emit light repeatedly under even a gentle touch, has generated significant research interest in developing materials, devices, and systems for various applications1,6. This talk outlines the crystal structures, underlying mechanisms, and ML behaviors of key material systems, including $SrAl_2O_4$-, ZnS-, $LiNbO_3$-, and $Sr_3Sn_2O_7$-based ferroelectric compounds. These multipiezo materials simultaneously exhibit intrinsic piezoluminescence, ML triggered purely by elastic deformation without frictional effects, and piezoelectricity, enabling unique synergies between mechanical force, electric fields, and light for applications such as stress sensing.

Recent investigations have underscored the importance of crystal structure, doping strategies, and piezoelectric properties in enhancing ML efficiency and reliability. The promising characteristics of ML materials suggest their potential use in stress and force sensors, structural health monitoring, mechanically responsive lighting, and advanced imaging technologies. Continued exploration and refinement of multipiezo materials may lead to groundbreaking advancements, further broadening their applicability in industrial and scientific fields. The study of ferroelectric ML materials also paves the way for the development of next-generation materials with distinctive electro-mechano-optical conversion properties.