黄昆半导体科学技术论坛

**第325期讲座**

**报告题目:** **Piezotronics and Piezo-phototronics of Third Generation Semiconductors**

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**A**bstract: Piezoelectricity, a phenomenon known for centuries, is an effect that is about the production of electrical potential in a substance as the pressure on it changes. For wurtzite structures such as ZnO, GaN, InN and ZnS, due to the polarization of ions in a crystal that has non-central symmetry, a piezoelectric potential (piezopotential) is created in the crystal by applying a stress owing to the presence of one atomic-layer thick polarization charges at the surface/interface. The effect of piezopotential on the transport behavior of charge carriers is significant in II-VI and III-V compound semiconductors due to their multiple functionalities of piezoelectricity, semiconductor and photon excitation. By utilizing the advantages offered by these properties, a few new fields have been created. Electronics fabricated by using inner-crystal piezopotential as a “gate” voltage to tune/control the charge transport behavior is named piezotronics, with applications in strain/force/pressure triggered/controlled electronic devices, sensors and logic units. Piezo-phototronic effect is a result of three-way coupling among piezoelectricity, photonic excitation and semiconductor transport, which allows tuning and controlling of electro-optical processes by strain induced piezopotential. Lastly, photon emission due to piezoelectric potential is also introduced as a new field of piezophotonics. The objective of this talk is to introduce the fundamentals of piezotronics and piezo-phototronics and to give an updated progress about their applications in human-machine interfacing, optoelectronics, sensors and chemistry (LED, solar cell, photon detectors, photon catalysis). Finally, these effects were also extended to 2D materials such as MoS2.

[1] W.Z. Wu, X.N. Wen, Z. L. Wang, Science, 340, 952-957 (2013);[2] C. F. Pan, et. al. , and Z. L. Wang. Nature Photonics, 7, 752-758 (2013);[3] W.Z. Wu and Z. L. Wang\*, Nature Review Materials, 1, 16031 (2016);[4] W. Z. Wu, et.al., and Z.L. Wang, Nature, 514, 470-474(2014).;[5] Z.L. Wang, “Piezotronics and Piezo-phototronics”, Springer, 2013.

**Biography:**王中林是佐治亚理工学院终身校董事讲席教授、Hightower终身讲席教授，是首位中组部“千人计划”顶尖人才与团队入选者，是中科院北京纳米能源与系统研究所首席科学家和创始所长，是国际公认的纳米科技领域领军人物。他在电子显微学，原位物性测量，一维氧化物纳米材料在能源技术、电子技术、光电子技术以及生物技术等应用方面均作出了原创性重大贡献。他发明了压电纳米发电机、摩擦纳米发电机，并首先提出了自驱动系统和蓝色能源的原创大概念,为微纳电子系统的发展、物联网、传感网络、人工智能和人类未来的能源开辟了新途径。他开创了纳米结构压电电子学和压电光电子学等领域，对纳米机器人、人-电界面、纳米传感器、LED技术的发展具有里程碑意义。王教授是中国科学院外籍院士和欧洲科学院院士。他在谷歌学术2018年公布的全球纳米技术专家学术引用与影响力排名榜之第一名（H index：208）。他荣获了美国显微镜学会1999年巴顿奖章，2011年美国材料学会奖章, 2012年美国陶瓷学会埃瓦德奥顿纪念奖奖, 2014年美国物理学会詹姆斯马克顾瓦迪新材料奖, 2013中华人民共和国国际科学技术合作奖，2014年佐治亚理工学院杰出教授终身成就奖, 2014年材料领域世界技术奖,2015年汤森路透引文桂冠奖, 2016美国东南地区大学联盟杰出科学家奖，2016欧洲先进材料奖；2016中国旅美科协“美国华人科技创新卓越领袖奖”；2016北京市华侨华人“京华奖”；北京市首位战略科学家奖；2017年潘文渊基金会杰出研究奖; 2017年全球纳米能源奖。王教授是美国物理学会fellow, 美国科学发展协会fellow，美国材料学会 fellow，美国显微学会fellow, 美国陶瓷学会fellow。

**时间: 2018年7月12日(星期四) 下午3:00**

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