洛珈讲坛　第377讲 武漢大學

WUHAN UNIVERSITY

Metal Silicide/Si interfaces: Contact Resistances and Origin of Fermi Level Depinning

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地点： 武汉大学樱顶老图书馆

主办单位： 武汉大学

承办单位： 武汉大学电气与自动化学院

简介： John Robertson于1971年本科毕业于剑桥大学物理专业，1975年在剑桥大学获博士学位。1975年至1994年，他在Central Electricity Generating Board工作，之后于1994年加入剑桥大学工程系。2015年入选英国皇家科学院院士（FRS），2020年入选英国皇家工程院院士（FREng）。他是APS Fellow、IEEE Fellow和MRS Fellow，同时也是《Diamond and Related Materials》等杂志的名誉编辑。他因在半导体上集成高κ氧化物方面的理论贡献而于 2023 年获得 IEEE Cledo Brunetti 奖。

Abstract: Metal/semiconductor Schottky barriers cause larger than necessary contact resistances. These are often reduced by using a high doping of the Schottky barrier in the absence of any other method. However, replacing metals with metal silicides causes a depinning of the Schottky contact. This allows the depinning of Schottky barrier and allows the barrier between Fermi level and one of the band edges to be reduced to lower values. The metal silicide induced depinning was firstly observed in 1980s. However, the fundamental cause of the depinning was only correctly identified in our work in 2020, which is caused by the unusual bonding at transition metal (TM) silicide/Si interfaces. These states span the gap as the TM is varied, and stimulate Fermi level depinning. This anomalous Fermi level pinning does not reduce gap state densities but could be used to better control SBHs by creating specific configurations with near band edge pinning energies, thus giving low contact resistances in highly scaled silicon devices, as well as wide bandgap or even 2D semiconductors.