复旦大学物理系 Colloquium

Time: 14:00, Tuesday, 2023.4.11

Location: C108, Jiangwan Physics Building（线下报告）

Recent progress in the study of topological materials Bi4X4 (X = I, Br)

姚裕贵 教授

北京理工大学物理学院

Abstract: A wide variety of topological materials presenting intriguing states of quantum matter have mostly been discovered in two-dimensional and three-dimensional systems. Recently, a novel quasi-one-dimensional family of bismuth halogenides, Bi4X4 (X = I, Br), has attracted considerable attention because it can be easily tuned by external pressure and cleaved in practical applications. Here, based on our theoretical predictions and experimental observations, we give a brief progress report on the study of these materials which exhibit rich phase diagrams including strong/weak and high-order topological insulators, composite Weyl semimetals. Many novel properties of these materials are also reported, including a room-temperature quantum spin Hall edge state based scanning tunnelling microscopy, pressure-induced superconductive and structural phase transitions, strong infrared absorption of the topologically originated edge states as well as a substantially increased carrier lifetime for the boundary states. These findings provide critically valuable information to understand the physics behind the new topological phenomena and offer a proof-of-principal methodology for studying their practical applications in the field of topological electronics, optoelectronics and spintronics.

报告人简介：姚裕贵，分别在南开大学获得物理学学士学位、中科院上海光机所获得光学硕士学位、力学所获得力学博士学位。毕业后曾先后在中科院物理所、Texas大学Austin分校从事博士后研究、物理所工作，2011年底调到北京理工大学工作。

现任北京理工大学杰出教授、物理学院院长、先进光电量子结构设计与测量教育部重点实验室主任、美国物理学会会士、长江学者、杰青、万人、国家重点研发计划项首席科学家，享受政府特贴，连续5年入选科睿唯安“高被引科学家”名单，曾荣获国家自然科学奖、北京市自然科学奖、北京市高等教育教学成果、中国科学院杰出科技成就奖等。作为院长，带领北理工物理学科入选国家一流学科建设名单。

研究领域为计算物理和凝聚态物理，发展了反常输运物理量与拓扑不变量的第一性原理计算方法，部分成果写进了教科书，是该领域开拓者之一；引领了硅烯等二维拓扑材料的研究，所提出的理论模型被冠名；完成了三维晶体中准粒子的分类并建立了百科，为搜寻和实现相关演生粒子提供了理论指导；发展了含能材料能量释放性能及感度快速检测技术，填补了相关GF领域技术空白。至今共发表SCI论文260余篇，在反常输运、硅烯、石墨烯、拓扑材料与物性等领域的研究成果具有重要国际影响，共被引约2万次，10篇超过500次。