Department of Physics
Condensed Matter Physics
Clarendon Laboratory, Parks Road, Oxford OX1 3PU

UNIVERSITY OF OXFORD

CONDENSED MATTER SEMINAR

Thursday 27 January at 14.30

"One Stop Shopping" Topology, Superconductivity and Magnetism in the FeTe1−xSex superconductors"

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There is mounting evidence from angle-resolved photoemission (ARPES),[i] NV optical detection of magnetic resonance (ODMR) [ii] and magneto-optic Kerr effect (MOKE) measurements, that, with the onset of superconductivity in the FeTe1−*x*Se*x* superconductors, a magnetic field develops in the surface region that breaks time-reversal symmetry and results in mass acquisition in a topological surface state. The combination of magnetism and topology offers the possibility of the Quantum Anomalous Hall Effect (QAHE). A competing ground state, topological superconductivity offers the platform for Majorana Fermions as has already been demonstrated on this surface.[iii] Such fermions have the potential for application in qubit technology. However, superconductivity and the QAHE are competing ground states. Here we review these important observations and also examine the role of Ni substitution for Fe. The presence of Ni is known to quench the superconductivity, potentially providing a more favorable environment for the QAHE and thus the disappearance of the former might enhance the possibility of the latter. In fact, we show that with Ni substitution the size of the magnetic field is reduced and indeed the surface magnetism disappears even faster than the superconductivity.

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i Nader Zaki, Genda Gu, Alexei Tsvelik, Congjun Wu and Peter D. Johnson, Proc.Nat.Acad.Sci., 118, e2007241118 (2021).

ii N.J. McLaughlin, et al., Nano Letters 21 , 7277(2021)

iii Dongfei Wang, et al., Science, 362, 333, (2018

Host : Seamus Davis
Simpkins Lee room/Zoom