

Introduction: Superconductivity in novel engineered structures

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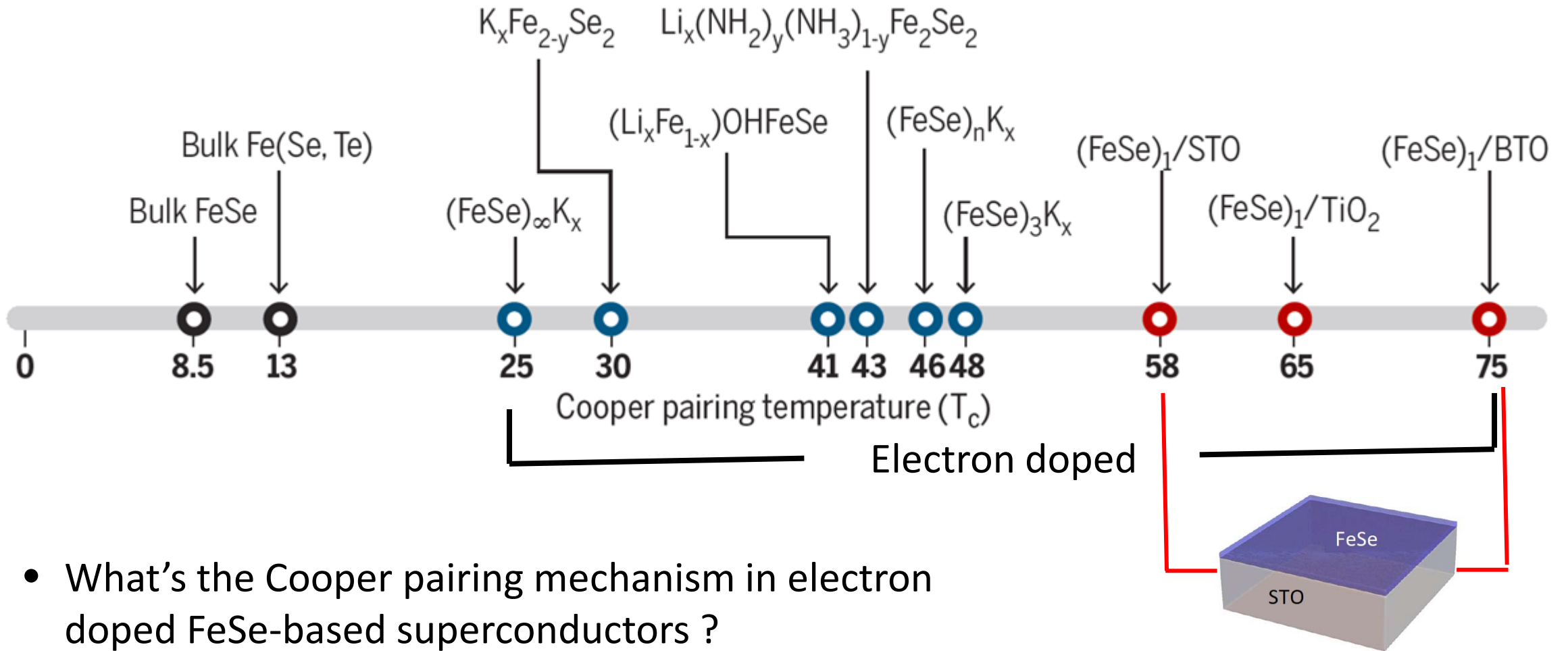
FeSe/SrTiO₃

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Gated 1 UC crystalline 2D film

- Unusual symmetry, and physical parameters.
- Confluence of the properties of the film and substrate

FeSe-based high T_c superconductors

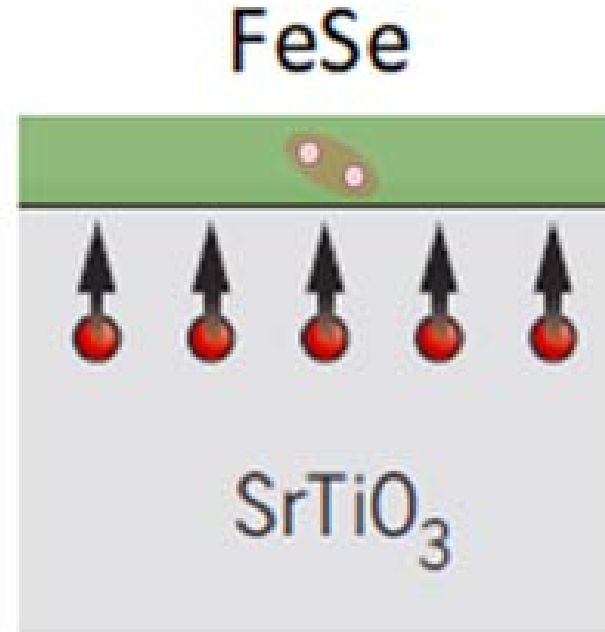
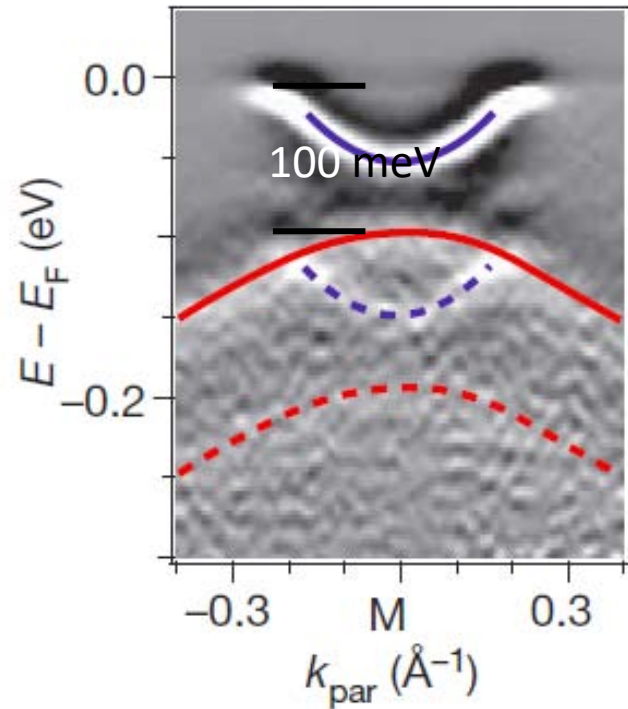


- What's the Cooper pairing mechanism in electron doped FeSe-based superconductors ?
- What is the T_c enhancement mechanism in 1UC FeSe/STO?

Interface strong electron-phonon coupling

FeSe/STO(001)

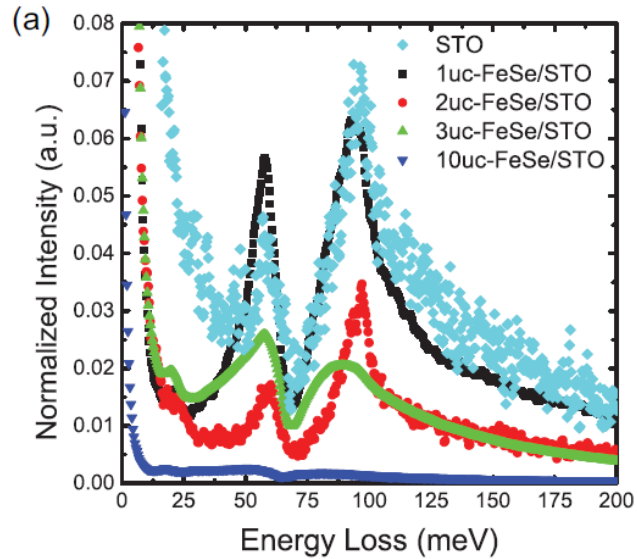
J.J. Lee et al, Nature 515, 245 (2014)



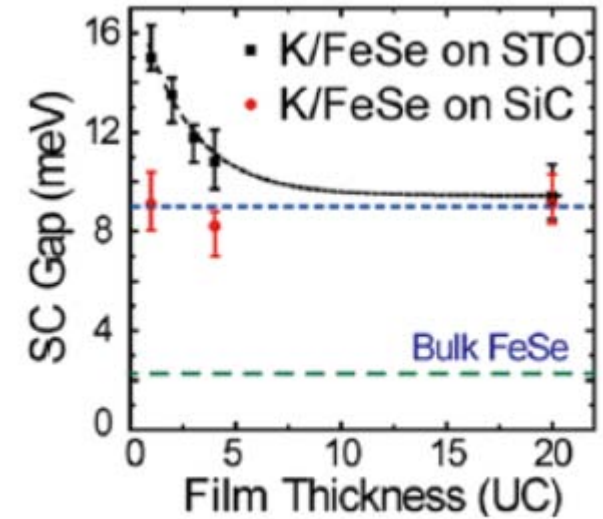
Replica band and high T_c are seen
In FeSe/BTO(001), FeSe/STO(110),
FeSe/TiO₂

Interface electron-phonon interaction enhanced Cooper pairing

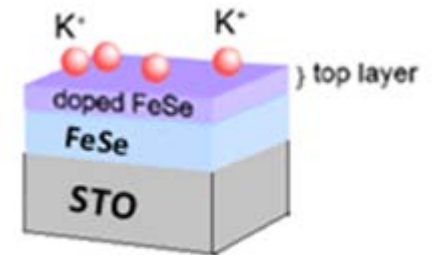
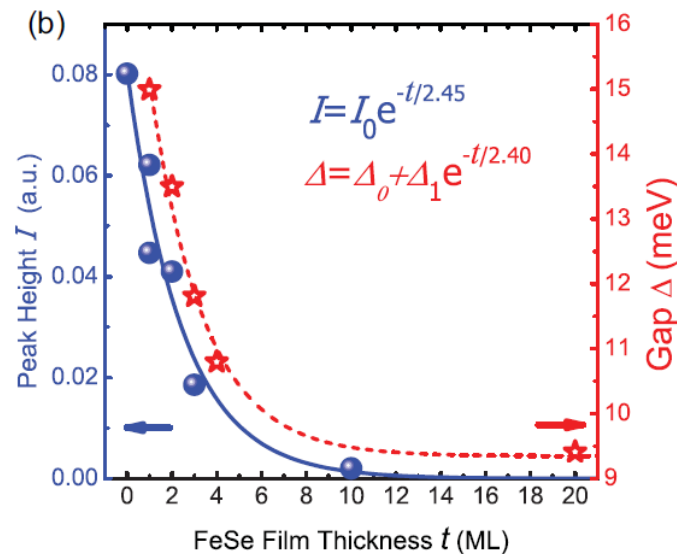
HEELS



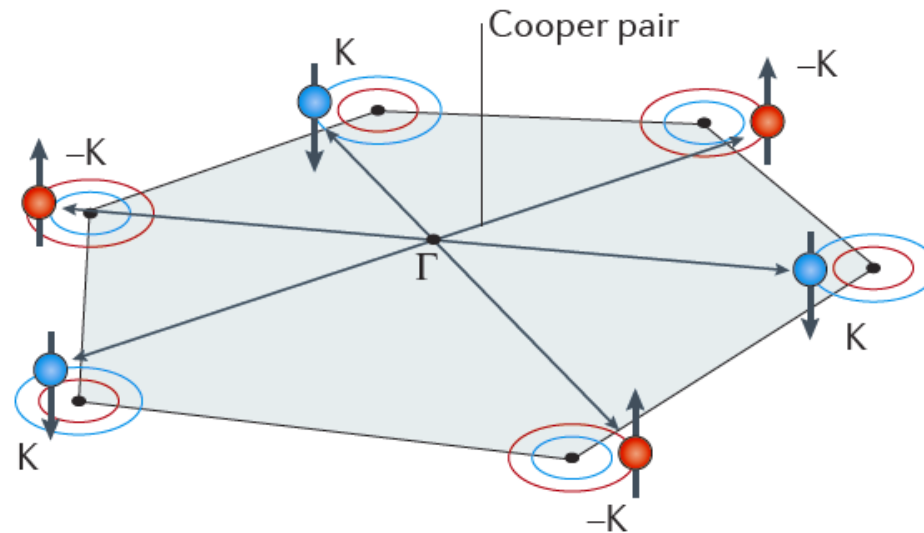
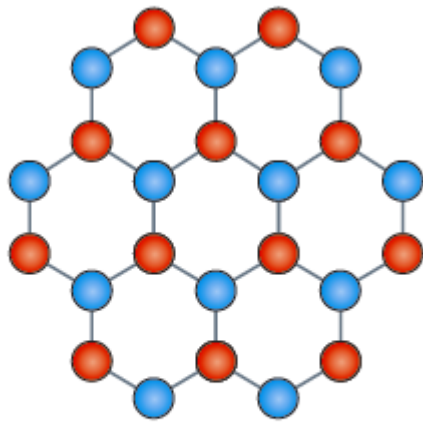
S. Zhang et al, PRB 94, 081116 (R) (2016)



W. Zhang et al, Nano Lett. 16, 1969 (2016).



Gated 2D crystalline systems



Ising-like spin-momentum locking

Dramatic enhancement of $H_{c2\parallel}$

Repulsive interaction drive Chiral topological SC or finite momentum Cooper pairing ?