

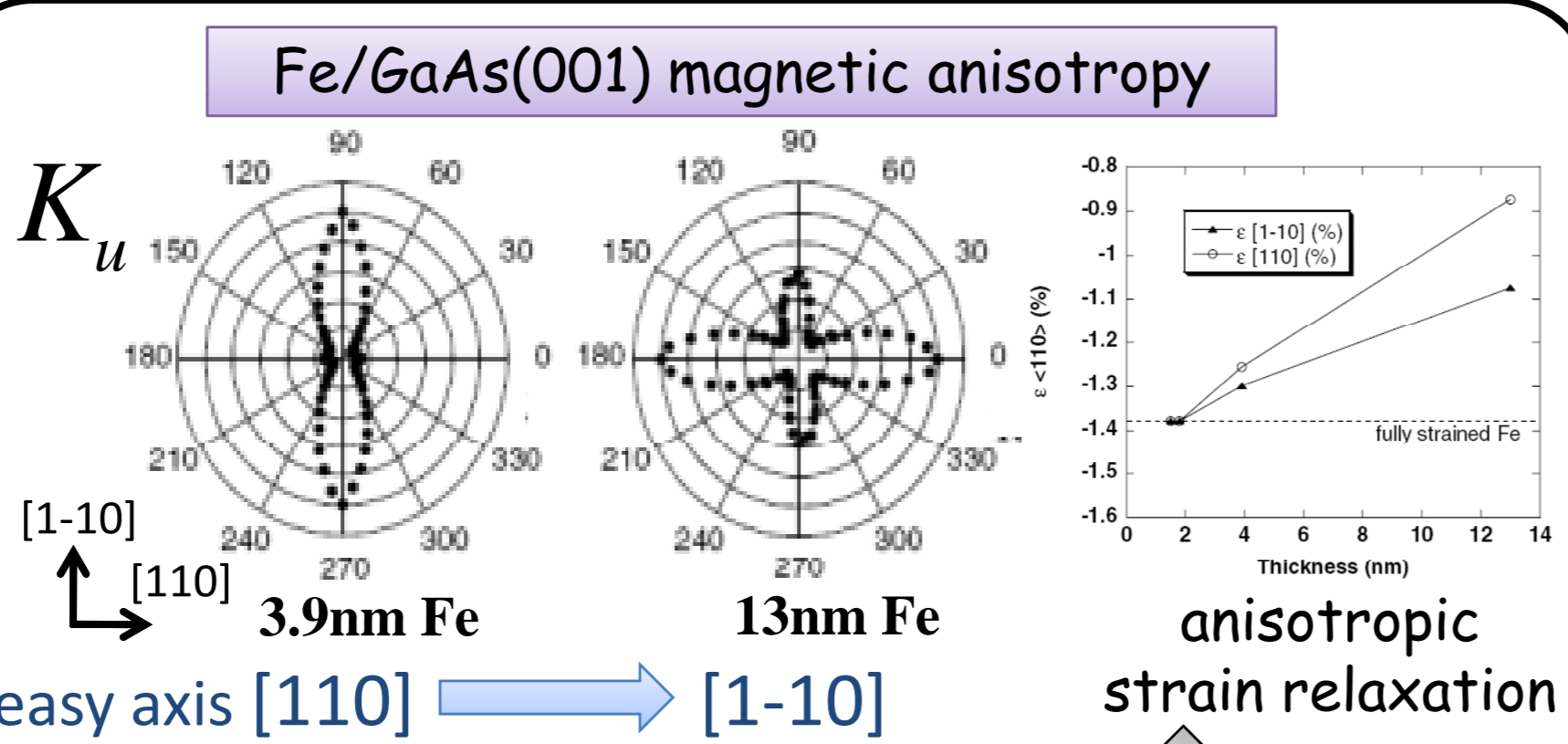
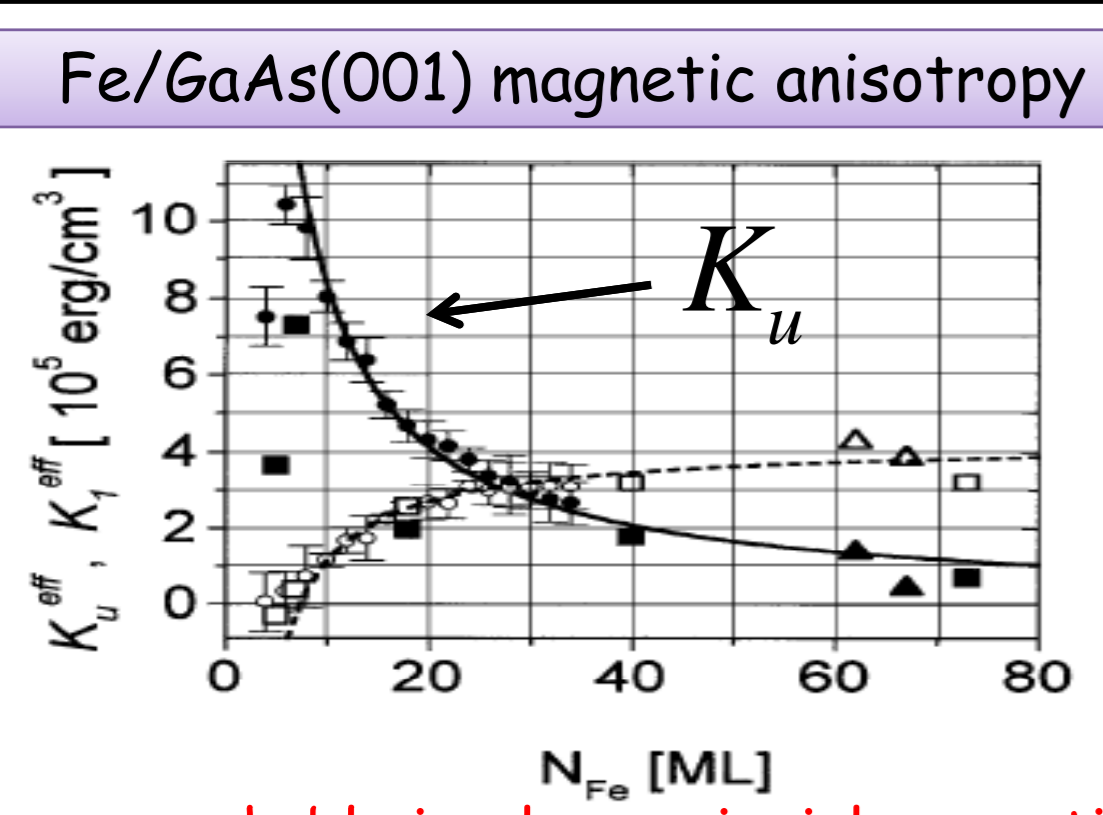
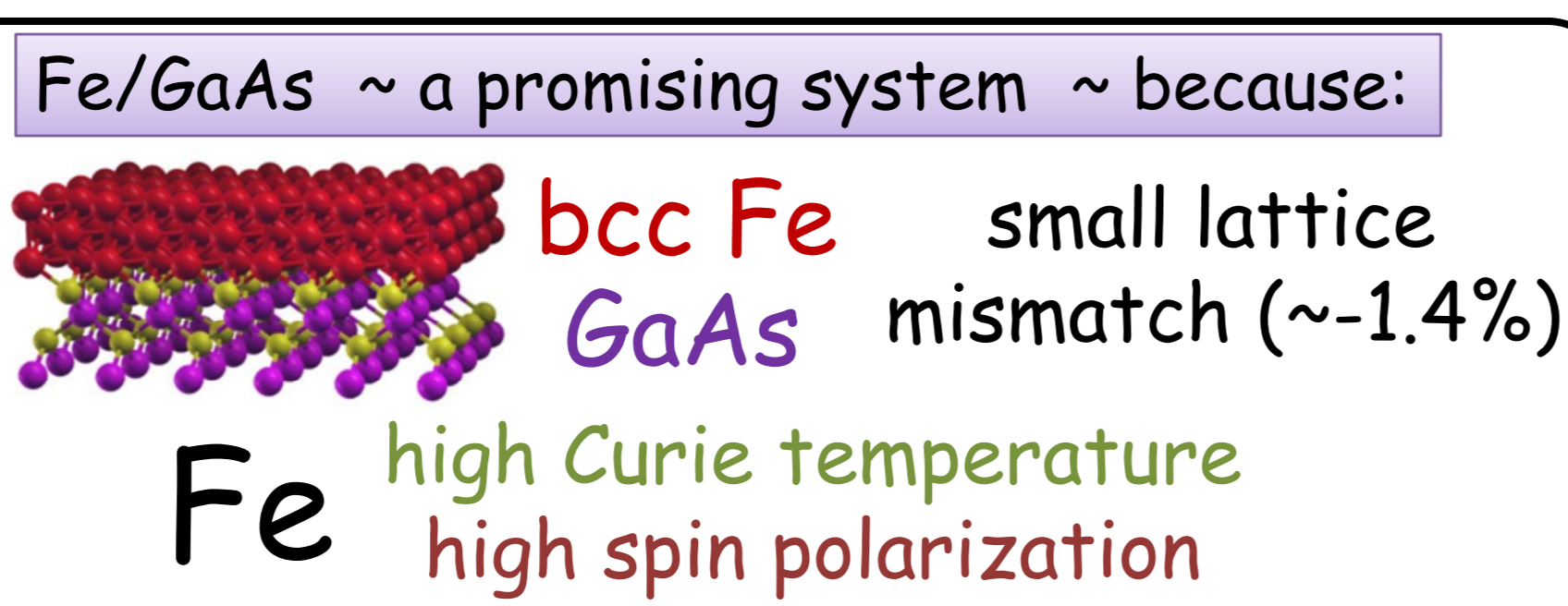
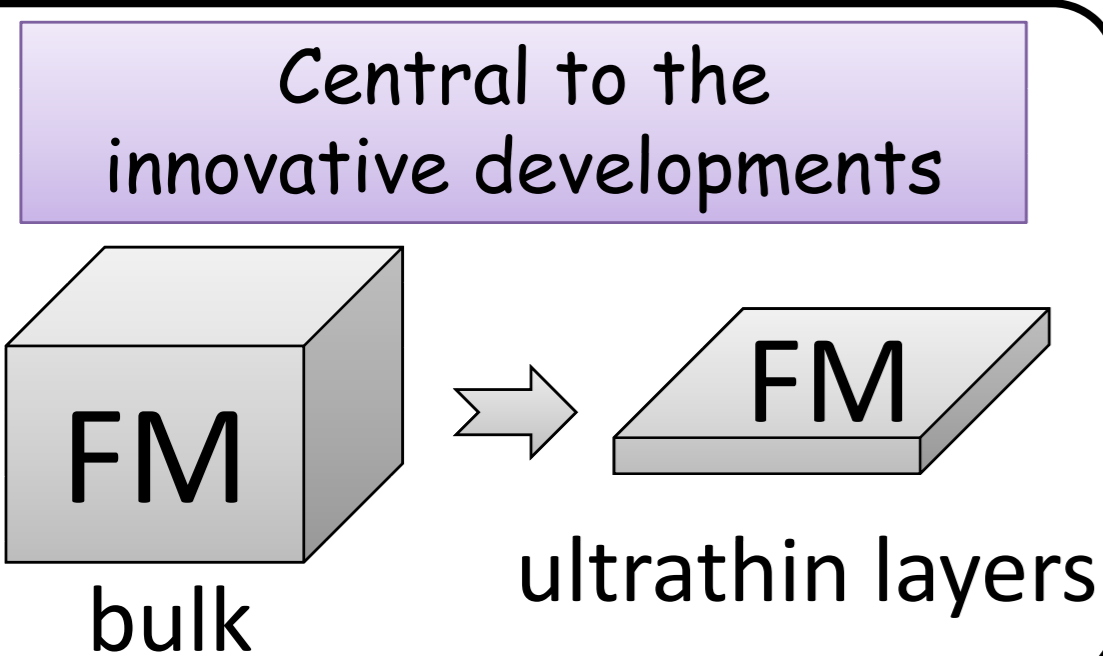
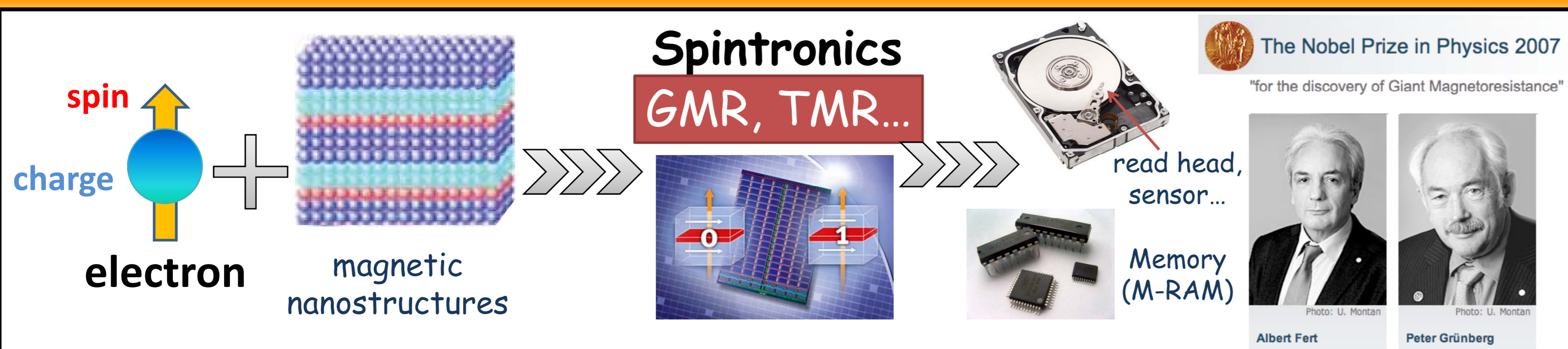


Uniaxial magnetic anisotropy of a Fe/GaAs(001) hybrid structure grown by molecular-beam epitaxy

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Introduction

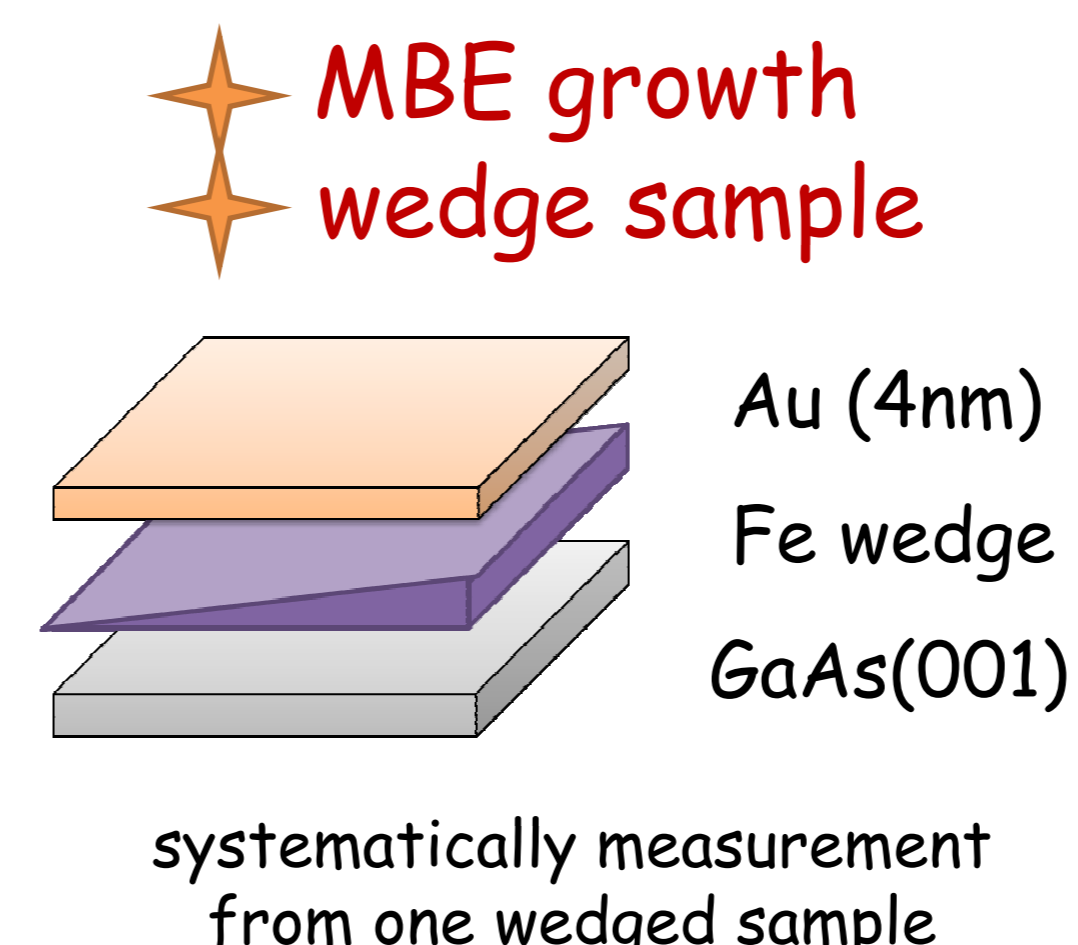


a remarkable in-plane uniaxial magnetic anisotropy (UMA) with an [110] easy axis
M. Brockmann, et al J. Magn. Mag.Mater. 198 384, (1999)
Origin of the UMA: purely interfacial character
 $K_u = K_u^s / d$ K_u^s is uniaxial interface term

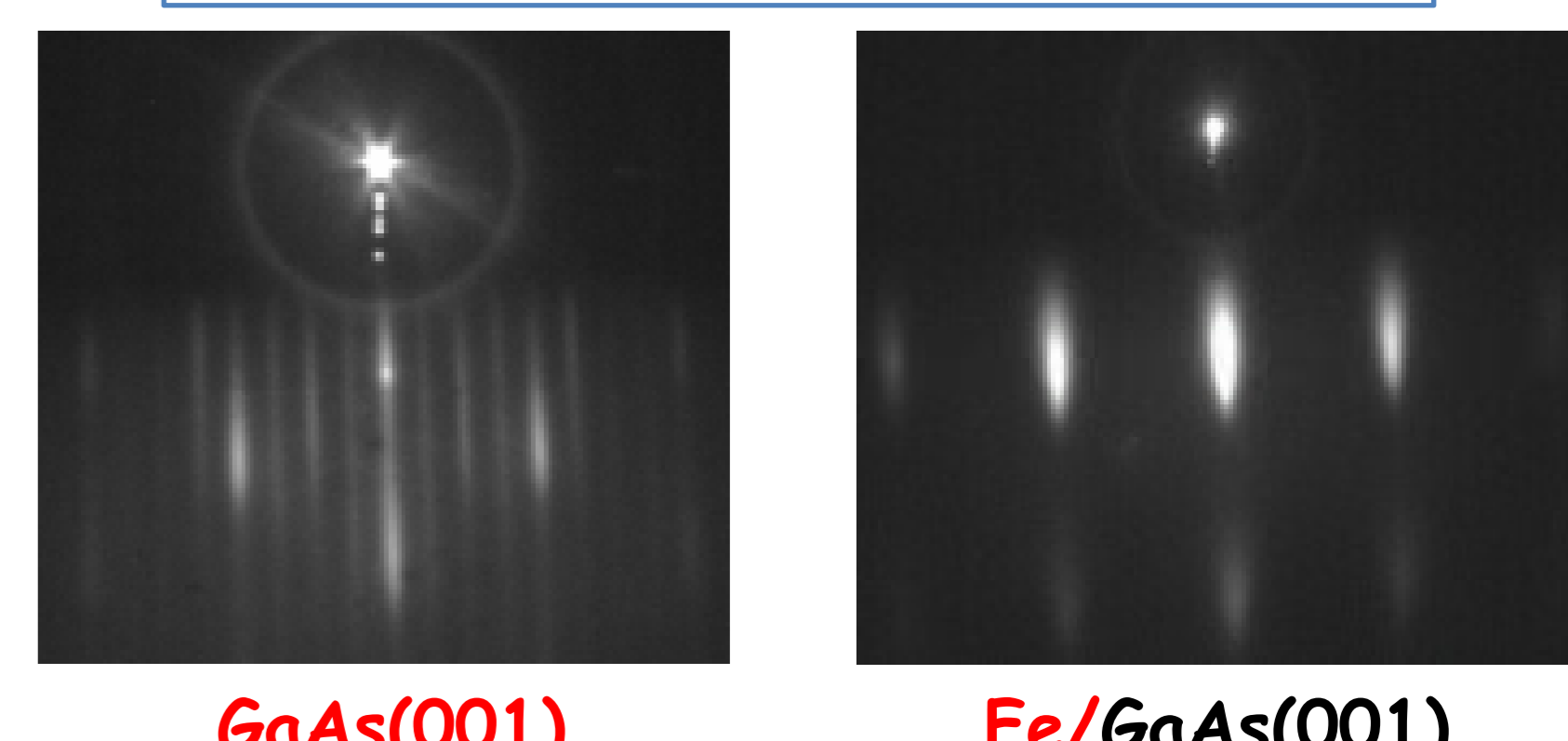
Not purely interfacial $K = K_u^v(d) + K_u^s / d$
Favor [1-10] Favor [110]
O. Thomas, et al., Phys. Rev. Lett. 90 017205 (2003)
Proper understanding of this UMA is needed

Experiment

Samples preparation

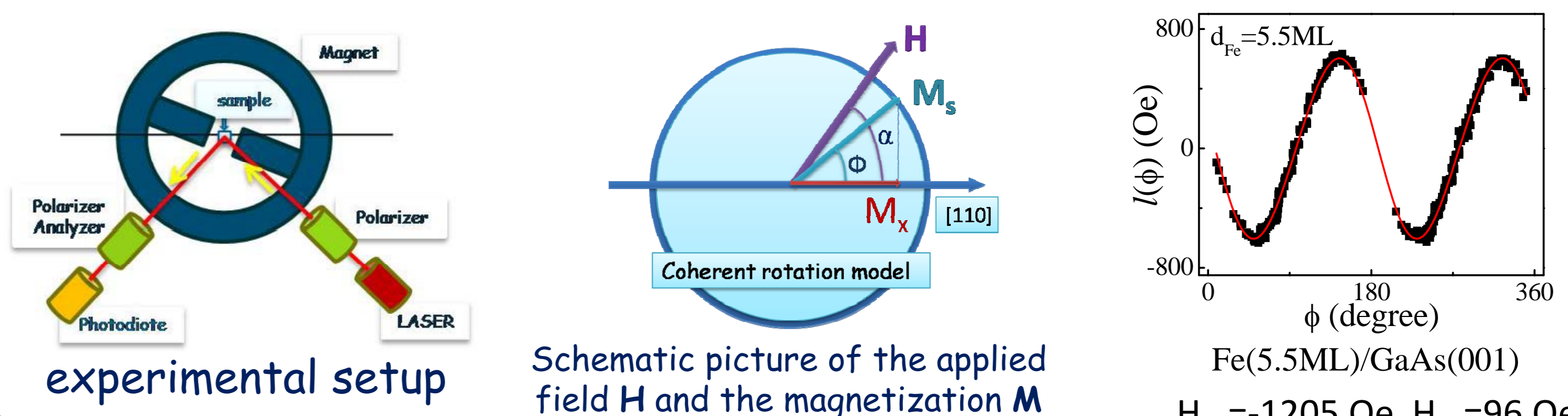


RHEED - single crystal structure



Measurement

Rot-MOKE (longitudinal MOKE with a rotating magnetic field)
quantitatively determine the in-plane magnetic anisotropy of thin film



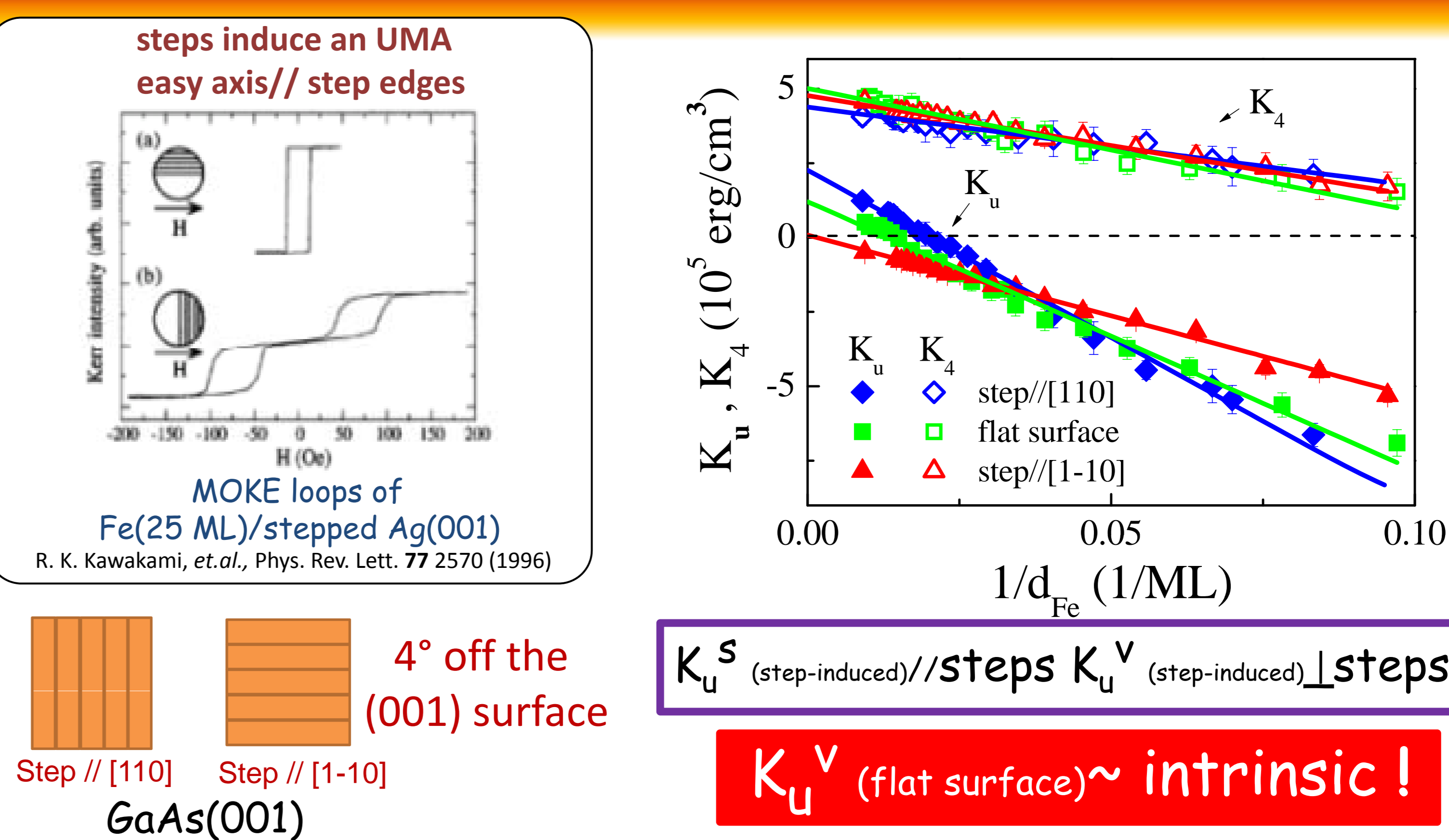
Results

Origin of K_u^v : growth-induced? or step-induced? or intrinsic?

Growth-induced magnetic anisotropy

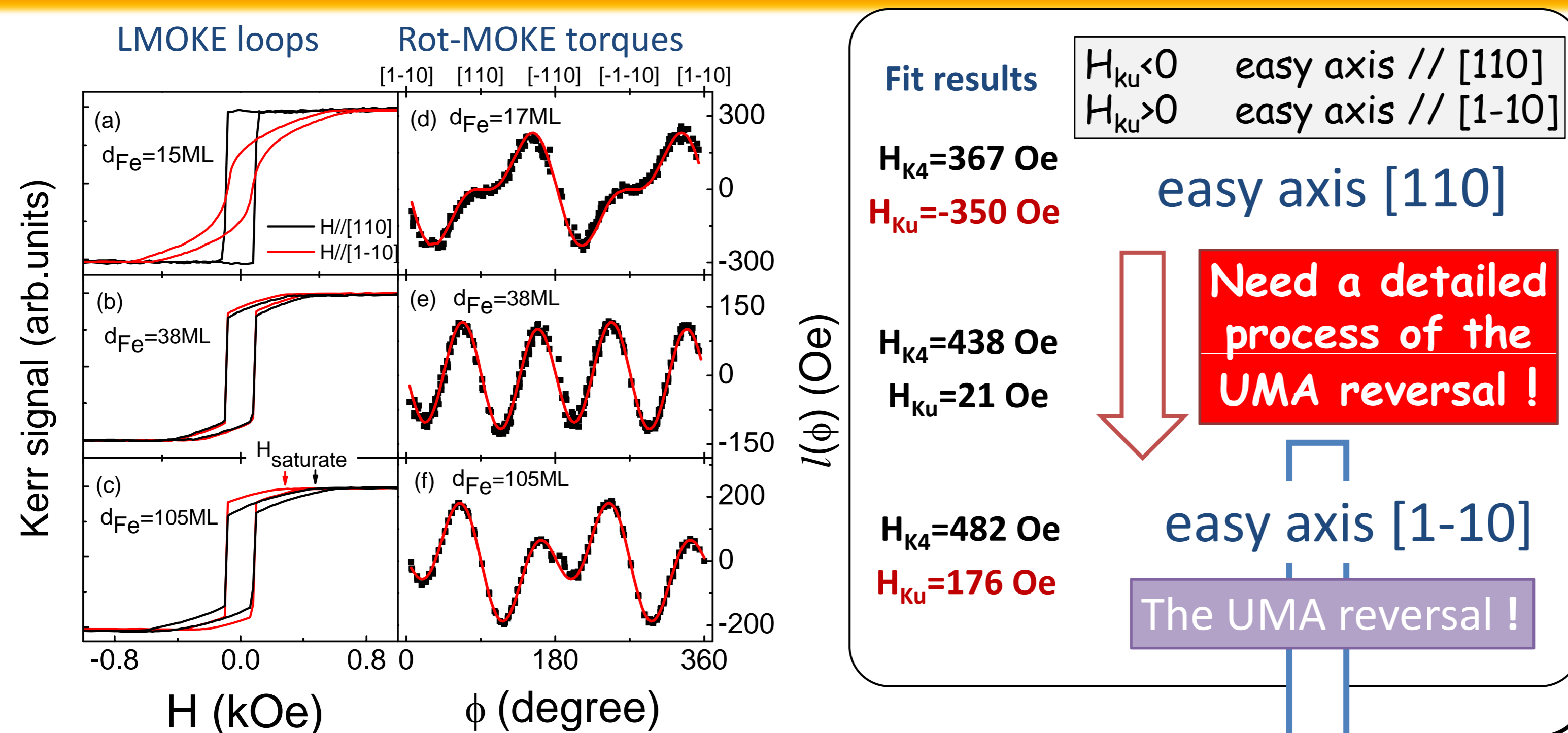
K_u easy axis \perp the incident Fe-beam direction
Yongsuo Park, et al., Appl. Phys. Lett. 66, 2140 (1995)
Our incident Fe-beam direction towards $\langle 100 \rangle$ can not induced $K_u // [1-10]$

Atomic step-induced magnetic anisotropy

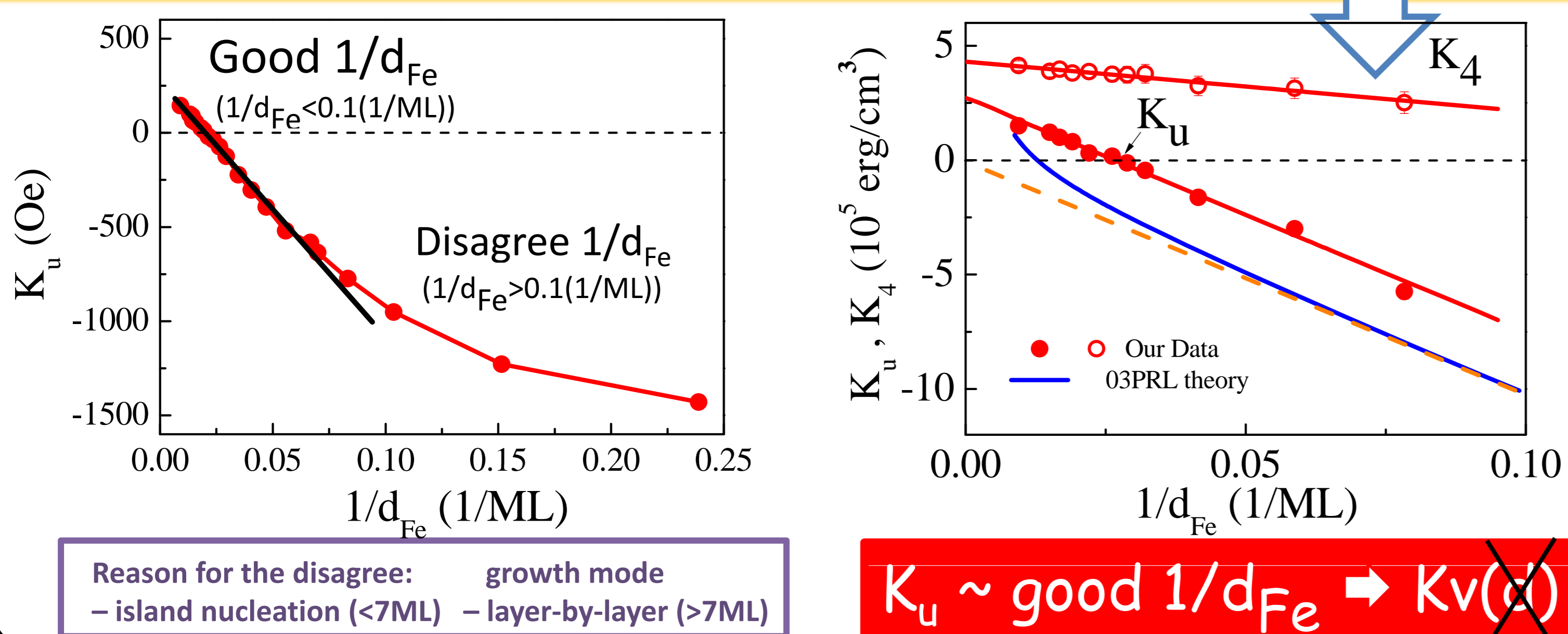


Results

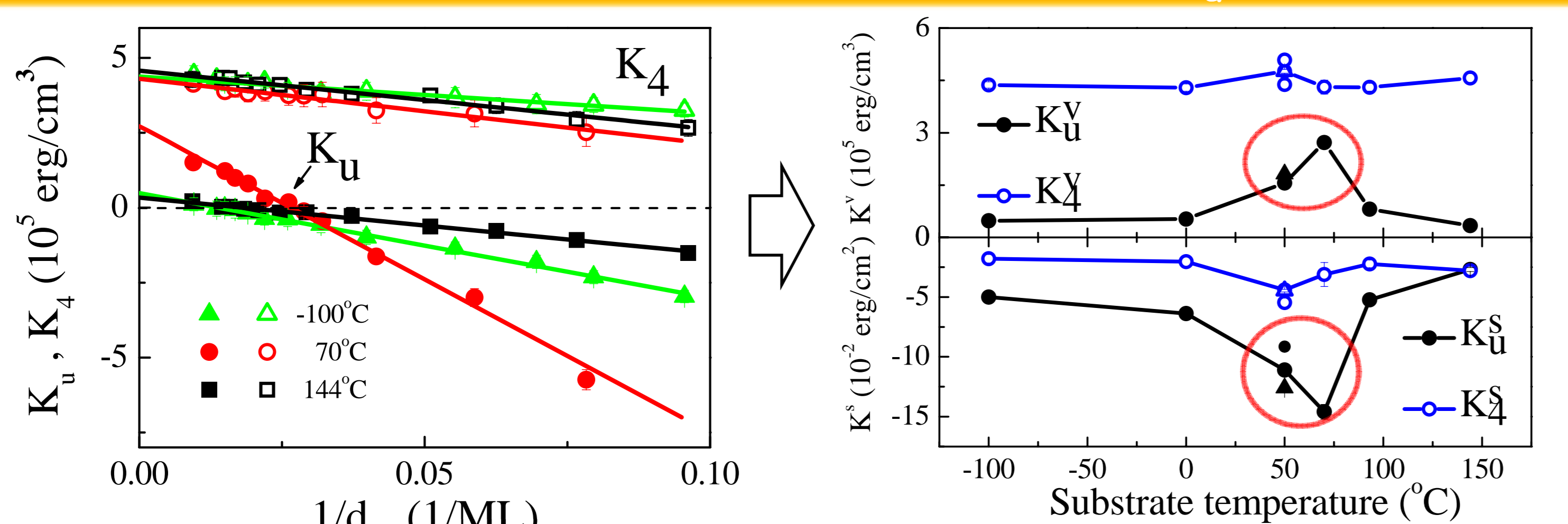
Magnetic anisotropy of Fe



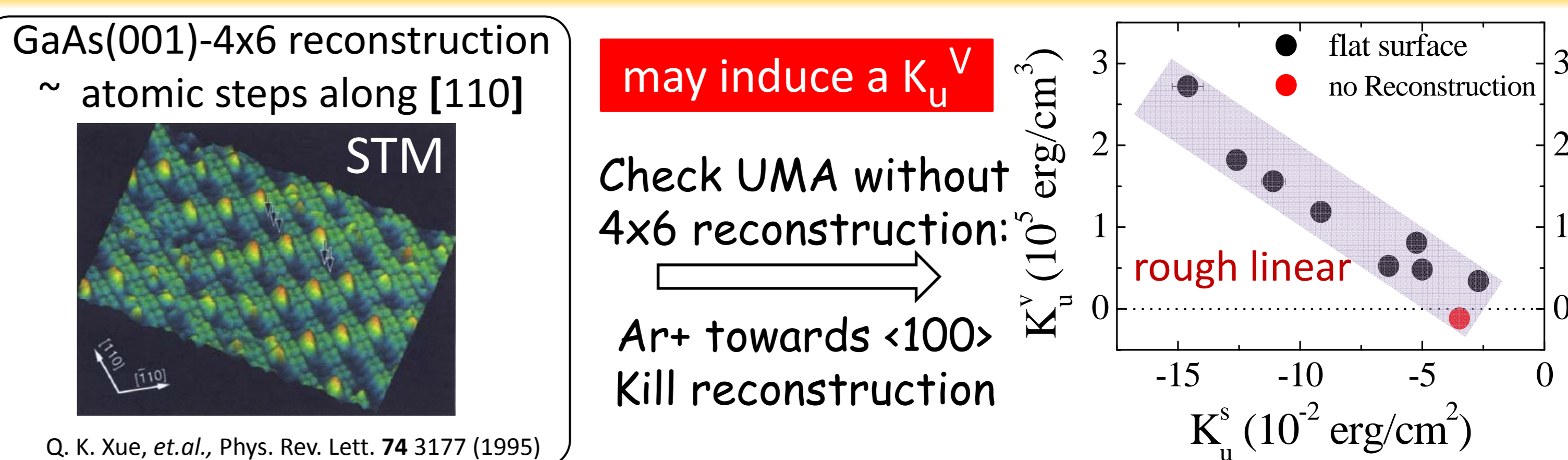
d_{Fe} dependence of the magnetic anisotropy



Growth-temperature dependent K_u



Discussion



Summary

- UMA ~ good $1/d_{Fe}$ $K_u^v \sim$ independent of d_{Fe}
- $K_u^s \sim$ growth-temperature dependent
- $K_u^v \sim$ may from GaAs(001) 4x6 reconstruction