Optical Investigation of the Charge Dynamics in $Ba(Fe_{1-x}Co_x)_2As_2$

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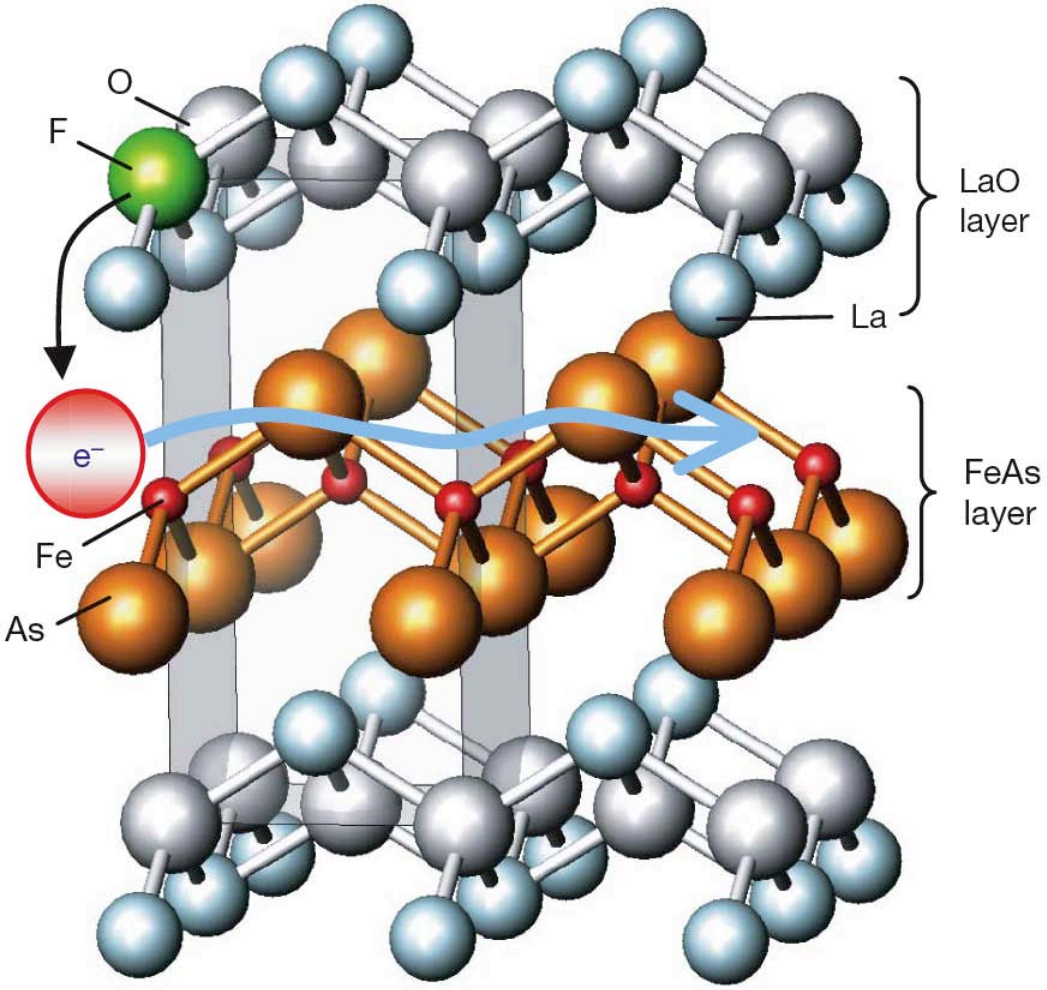
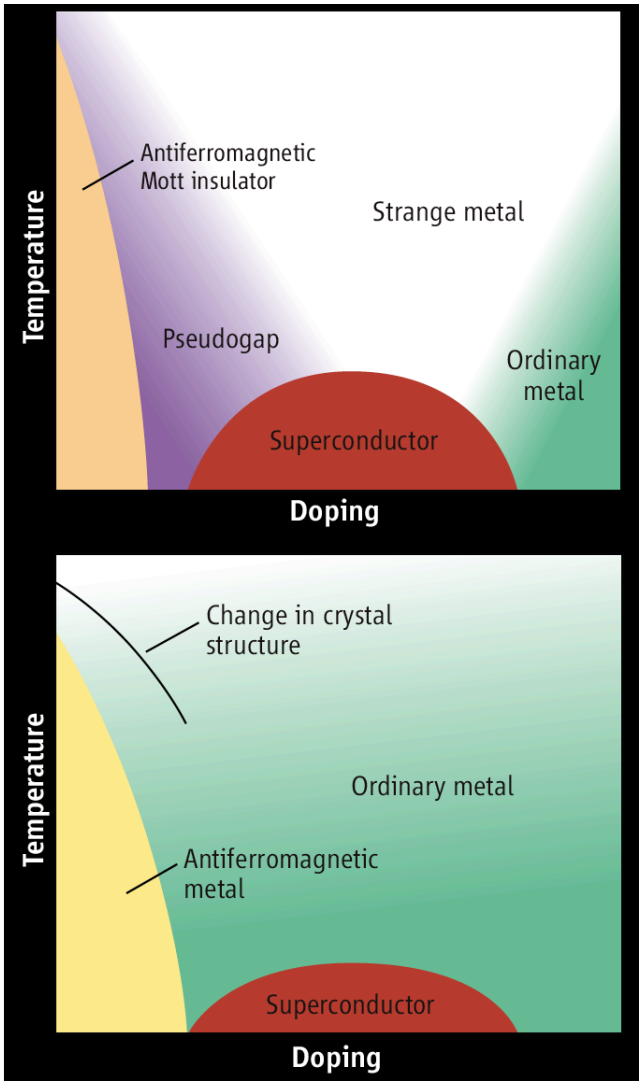
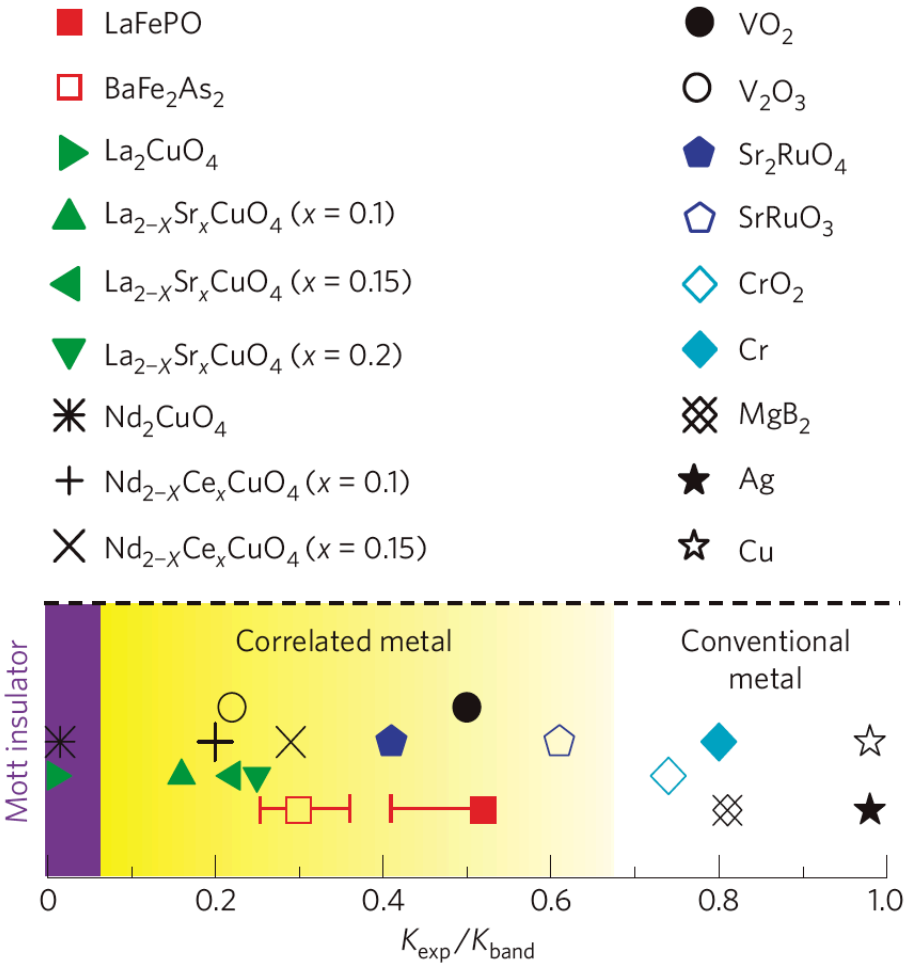
Iron-based versus Cuprate Superconductors

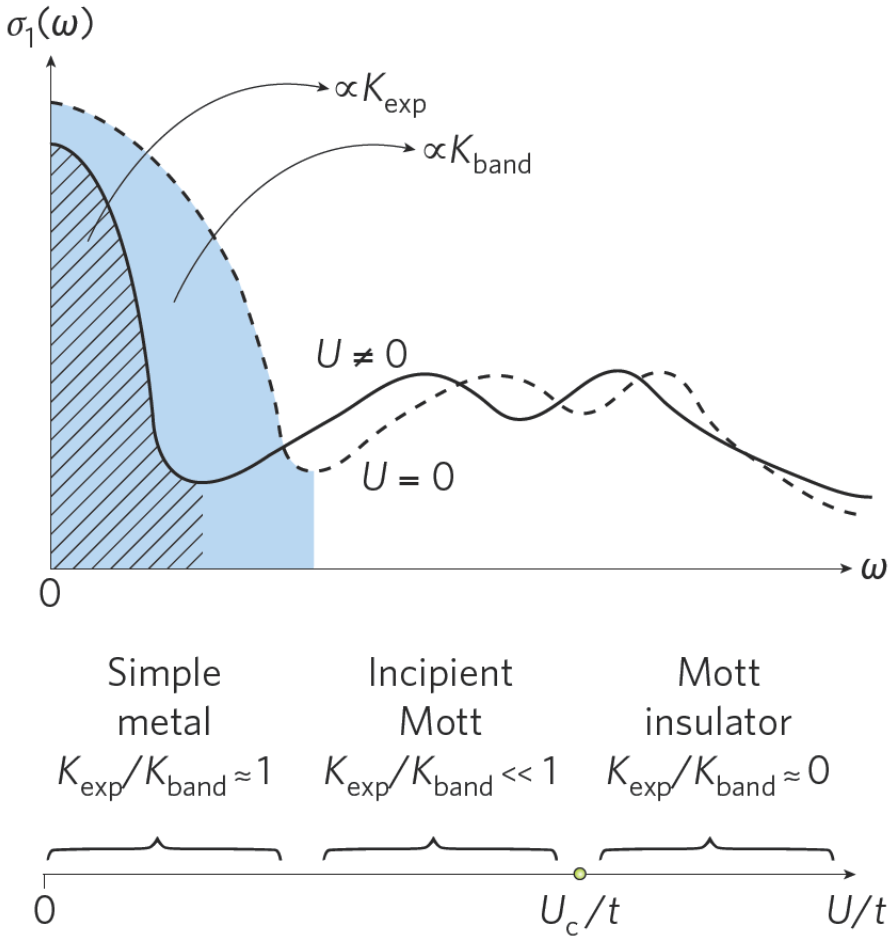




Cho, Science **327**, 1320 (2010)

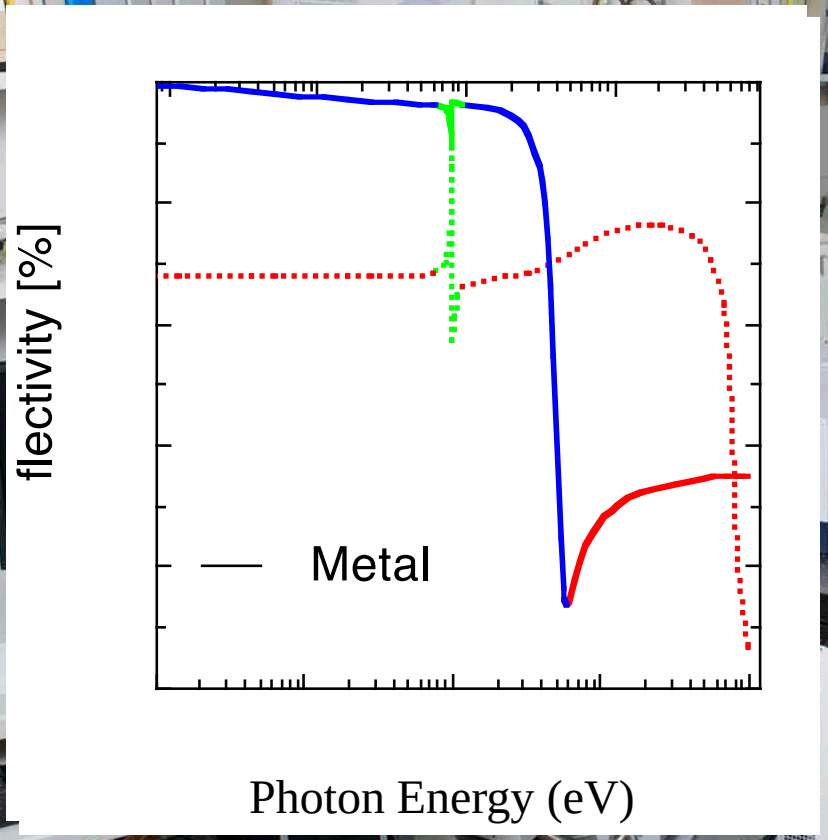
How Strong Are Electronic Correlations in Iron-Pnictides?

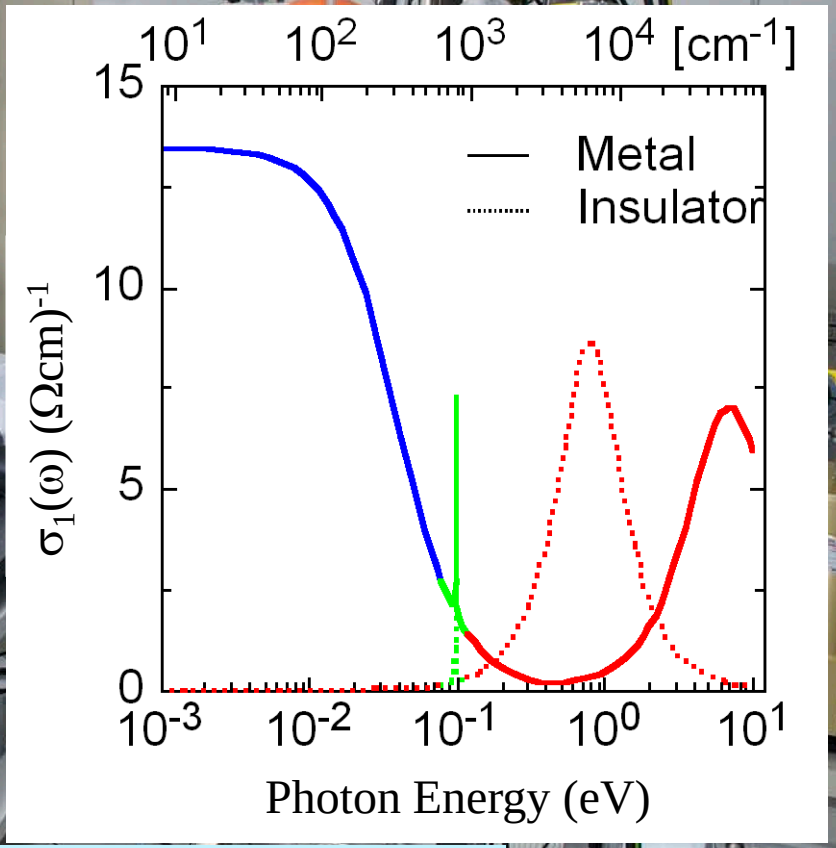




Qazilbash et al., Nature Physics **5**, 647 (2009)

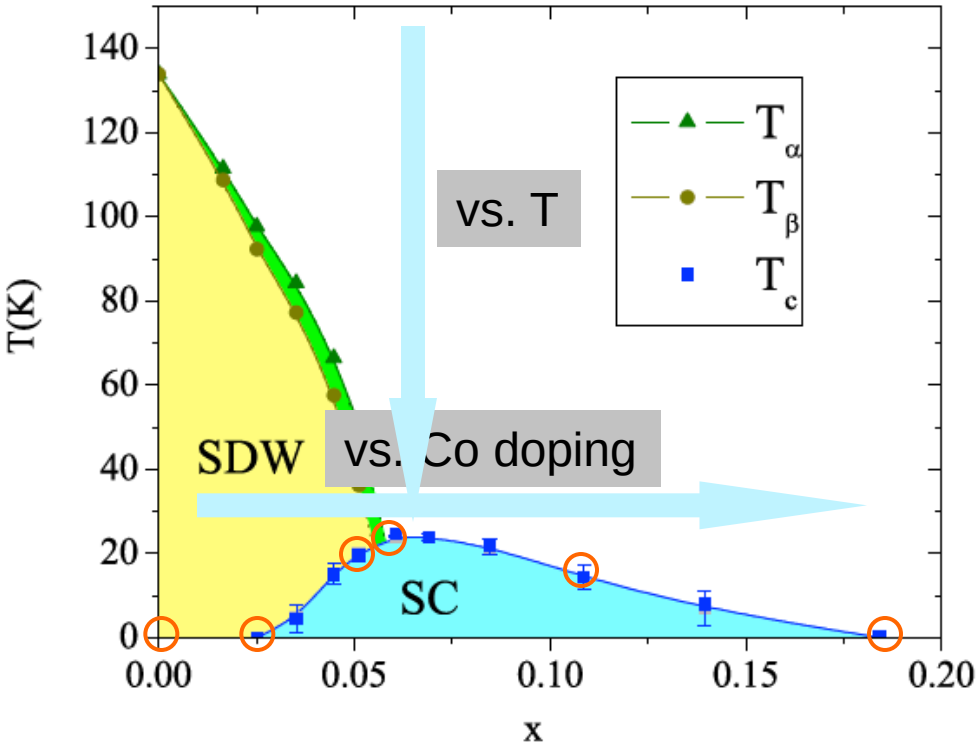
Kramers-Kronig

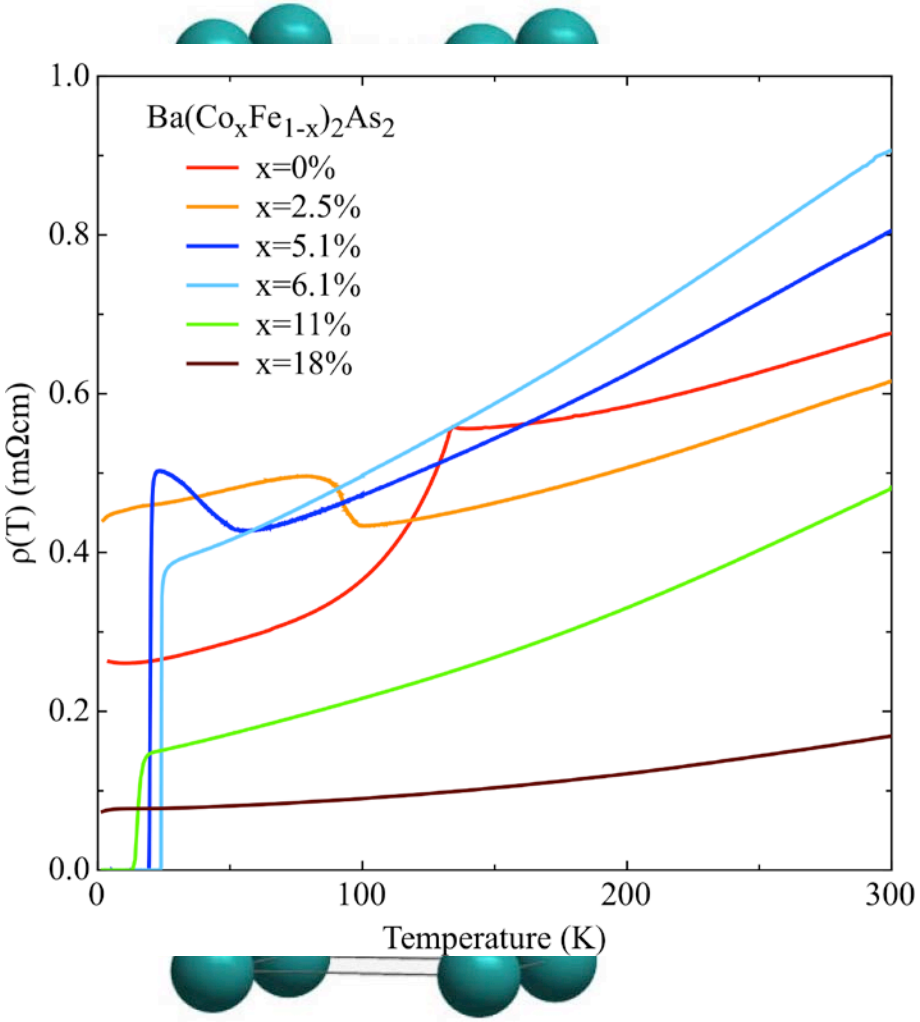




http://www.solidphys.ethz.ch/spectro/

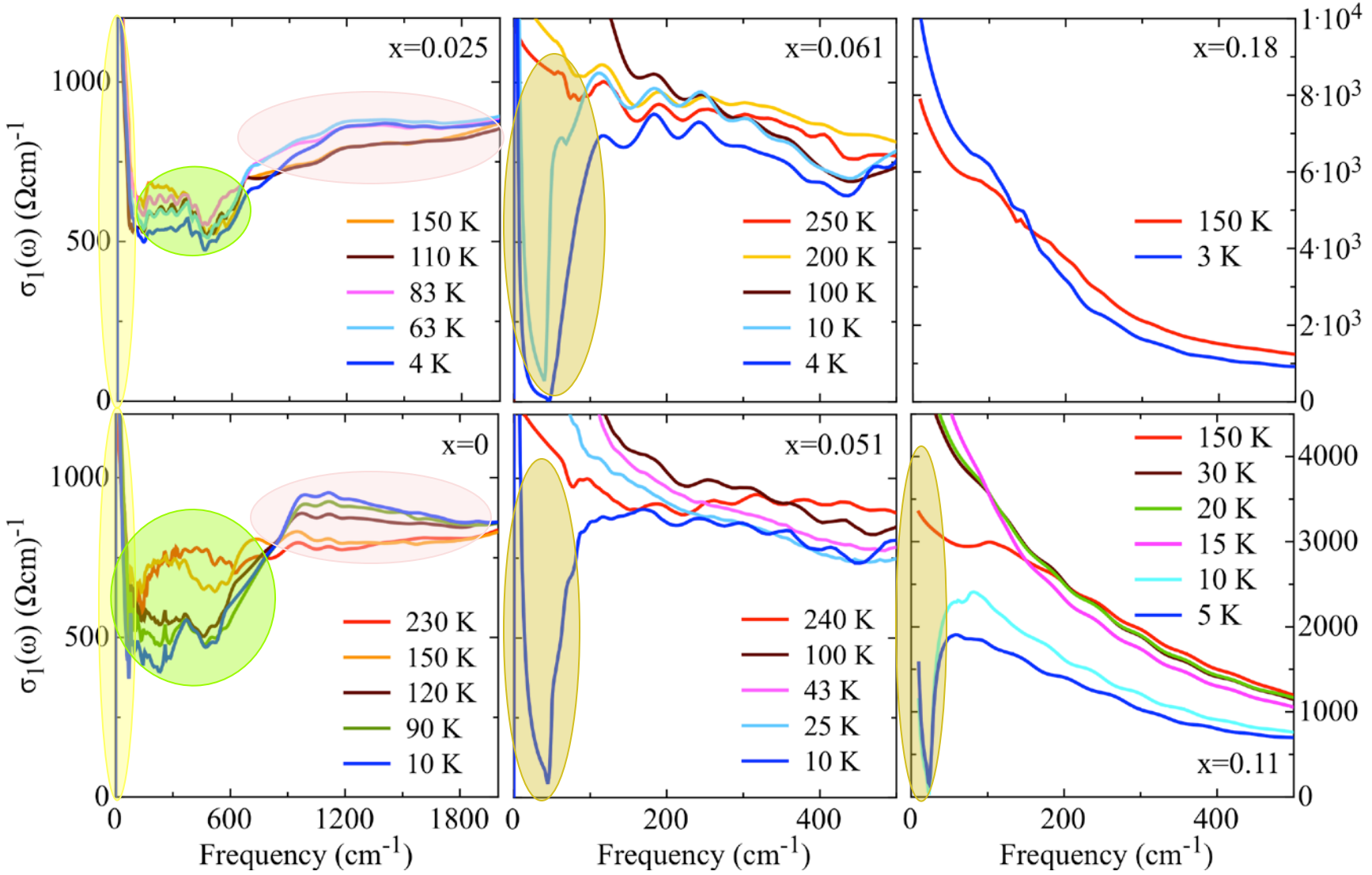
Phase Diagram and DC Transport Properties in $Ba(Fe_{1-x}Co_x)_2As_2$



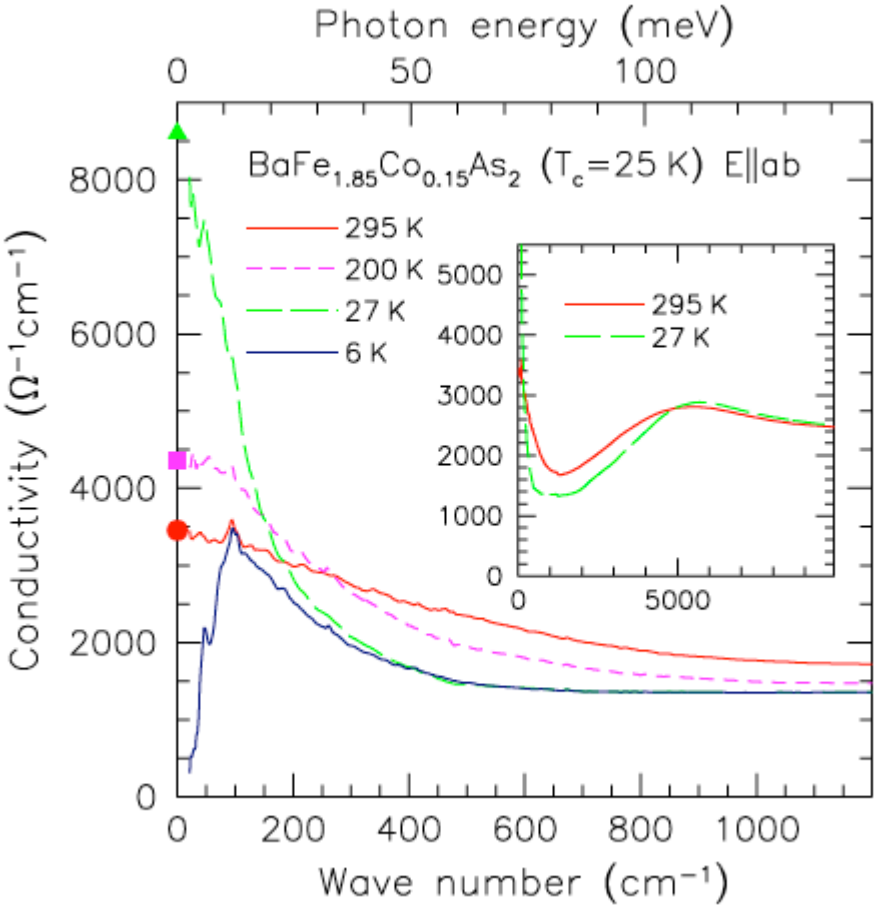


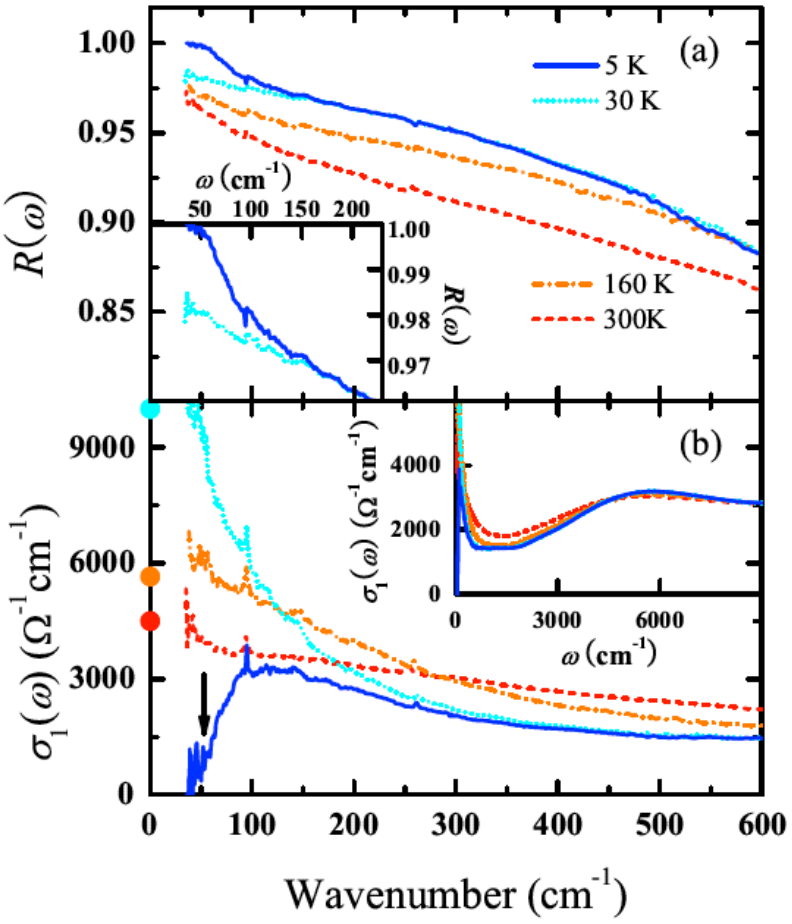
Chu et al., Phys. Rev. B **79**, 014506 (2009)

Optical Conductivity of $Ba(Fe_{1-x}Co_x)_2As_2$



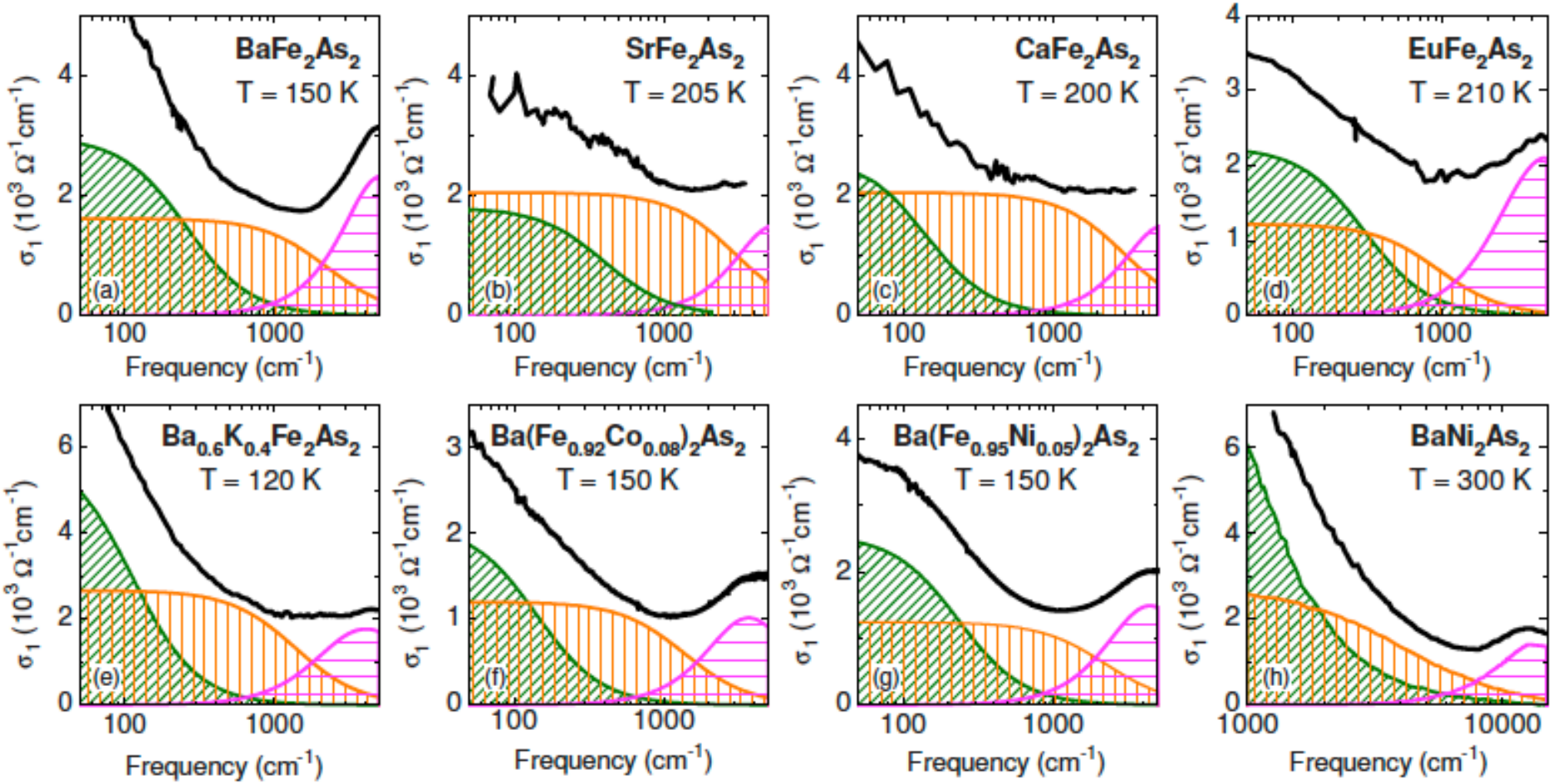
Optical Conductivity of $BaFe_{1.85}Co_{0.15}As_2$ and $BaFe_{1.87}Co_{0.13}As_2$





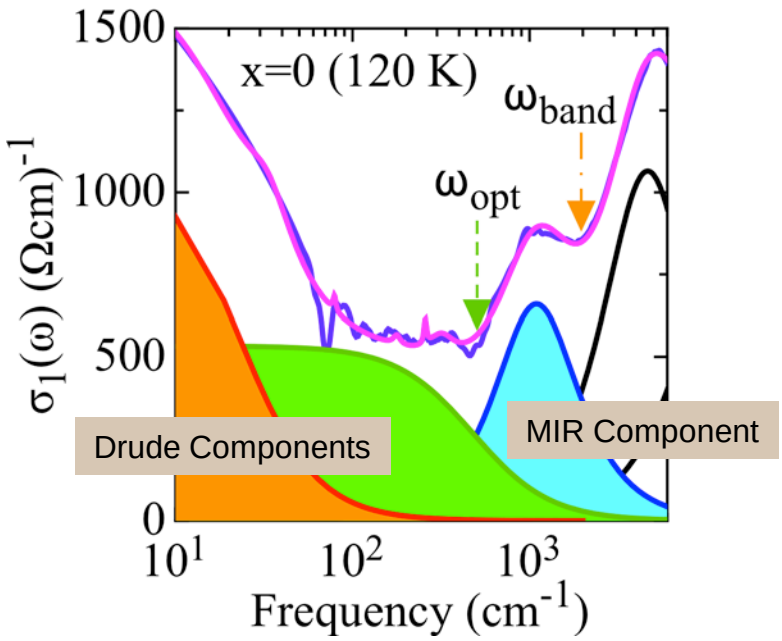
Tu et al., Phys. Rev. B **82**, 174509 (2010) and Kim et al., Phys. Rev. B **81**, 214508 (2010)

Optical Conductivity of Different Iron-Pnictides

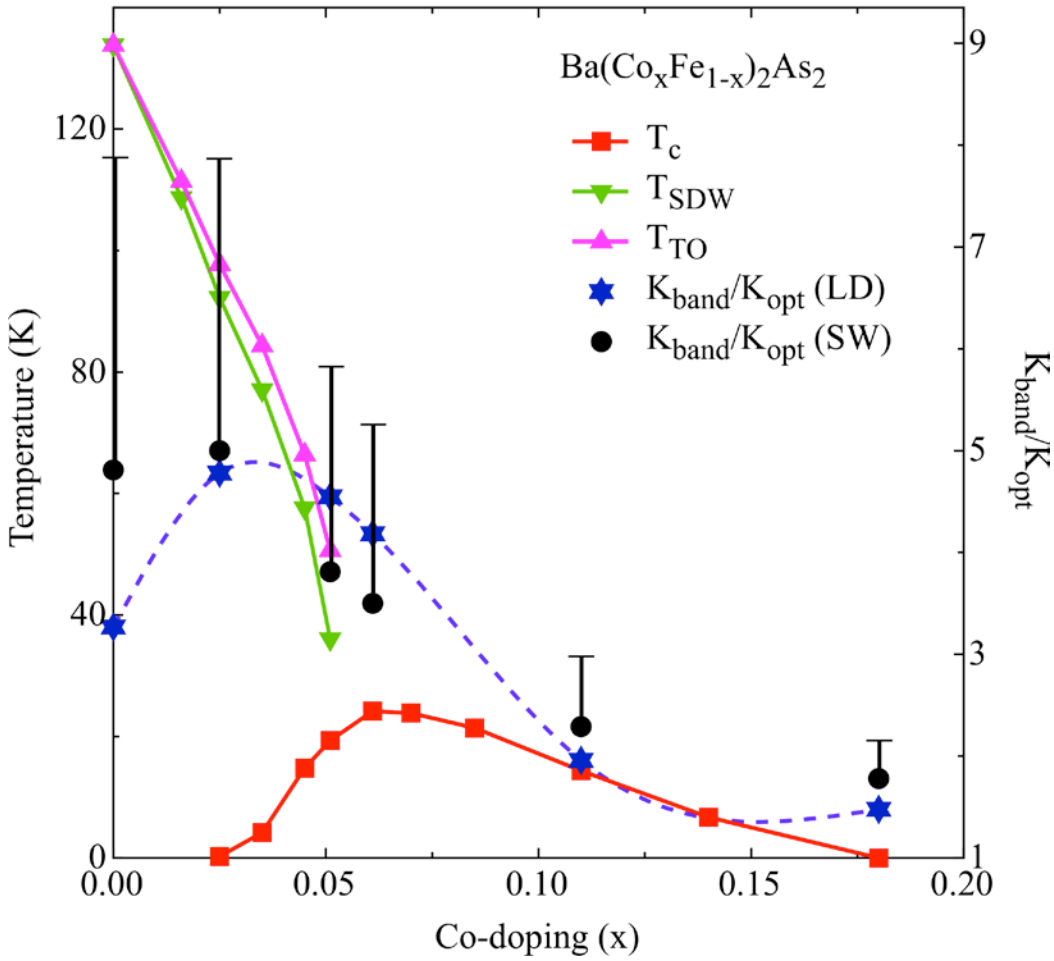


Wu et al., Phys. Rev. B **81**, 100512(R) (2010)

Electronic Correlations and Phase Diagram in $Ba(Fe_{1-x}Co_x)_2As_2$

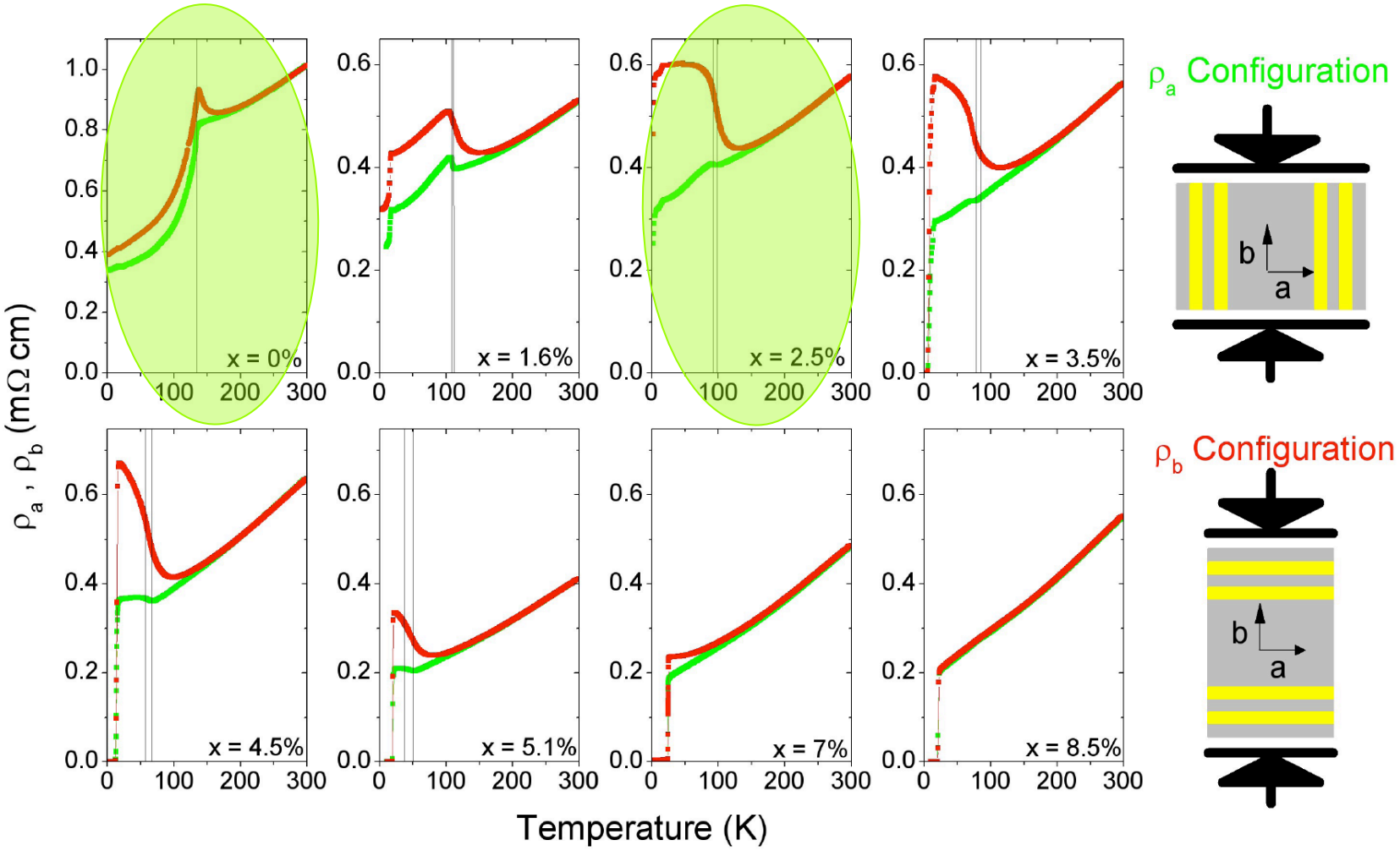


$$\frac{K_{opt}}{K_{band}} = \frac{\omega_p^2}{\omega_p^2 + \left(\omega_p^{MIR}\right)^2} = \frac{\int_0^{\omega_{opt}} \sigma_1(\omega)d\omega}{\int_0^{\omega_{band}} \sigma_1(\omega)d\omega}$$



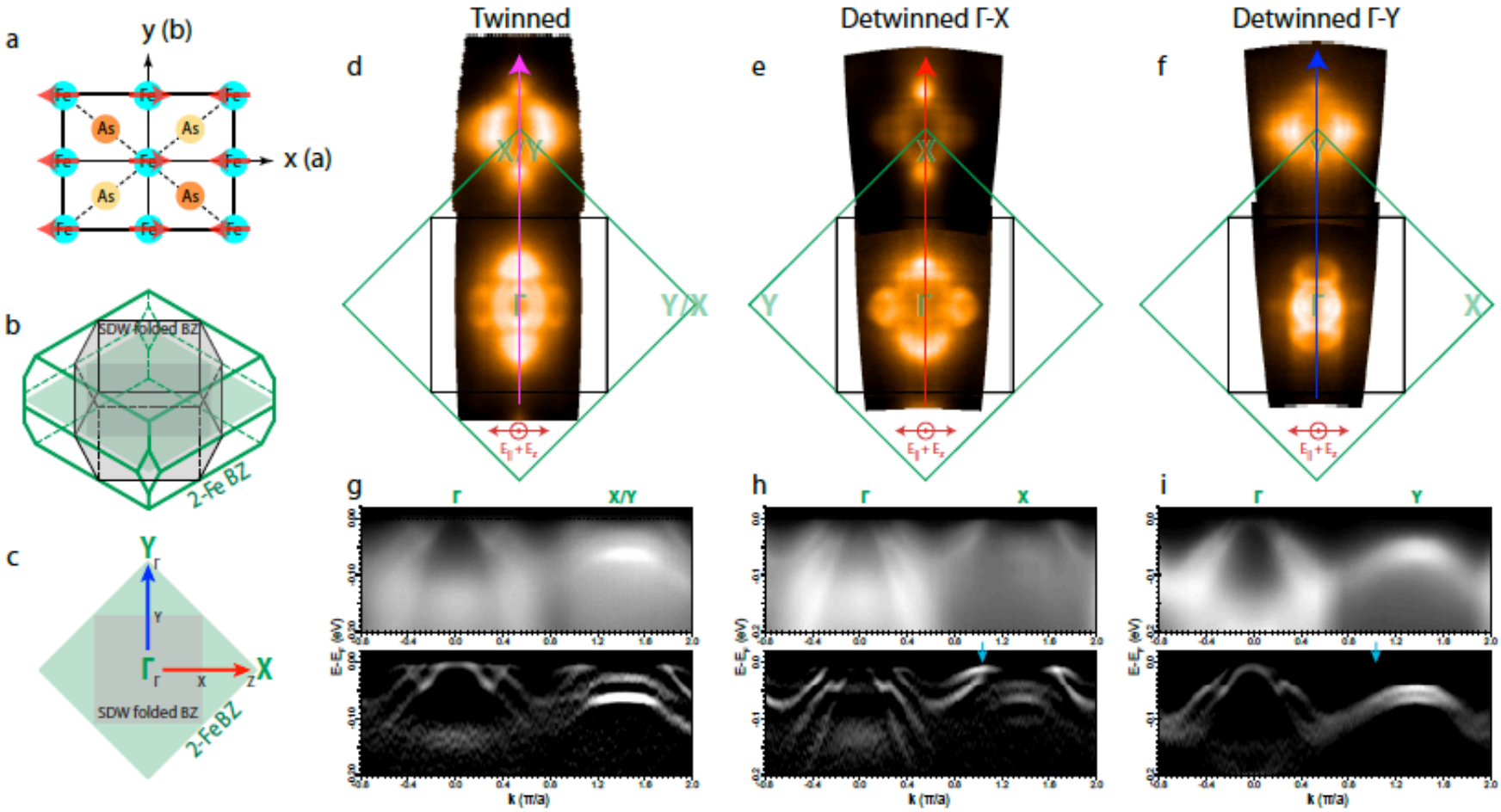
Lucarelli et al., New J. Phys. **12**, 073036 (2010)

Pressure-induced Detwinning of 122 - Compounds



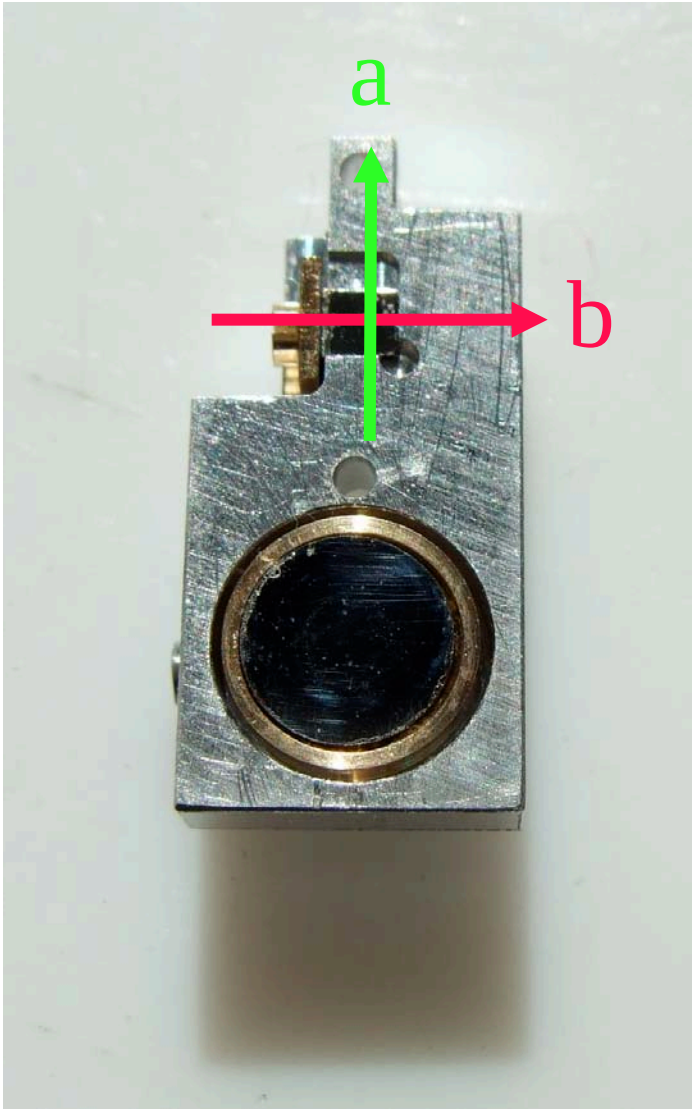
Chu et al., Science **329**, 824 (2010)

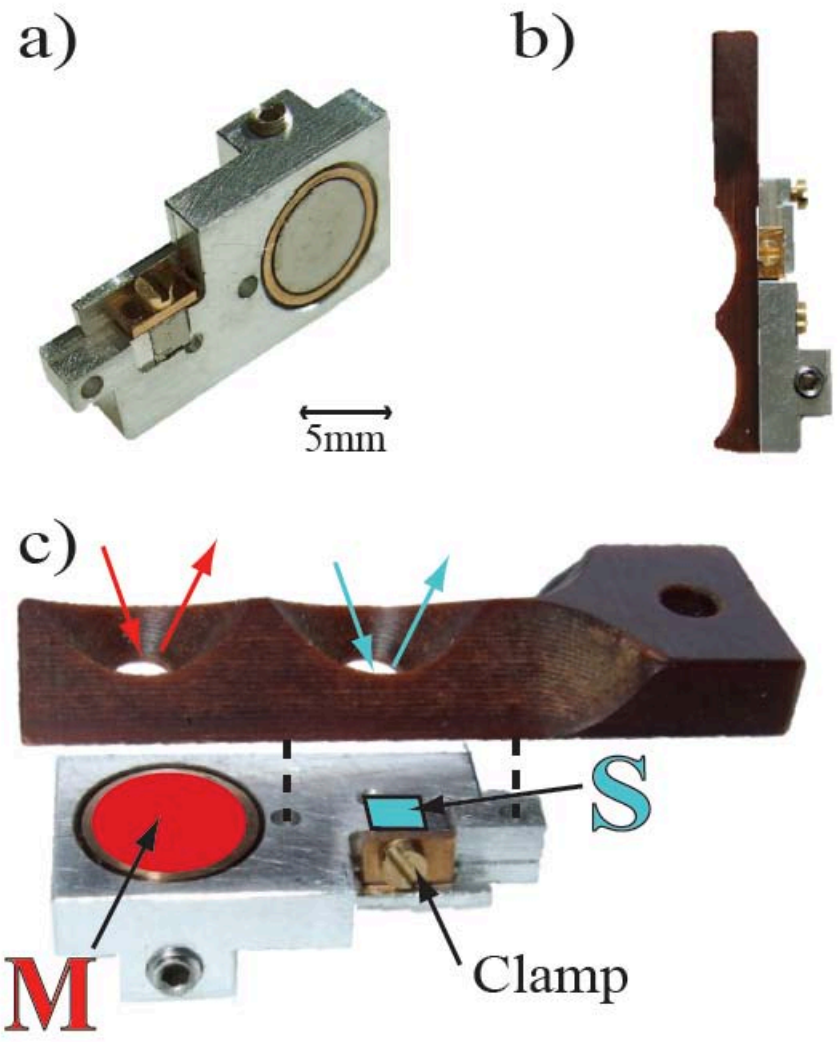
Anisotropy in Electronic Structure on Detwinned $BaFe_2As_2$



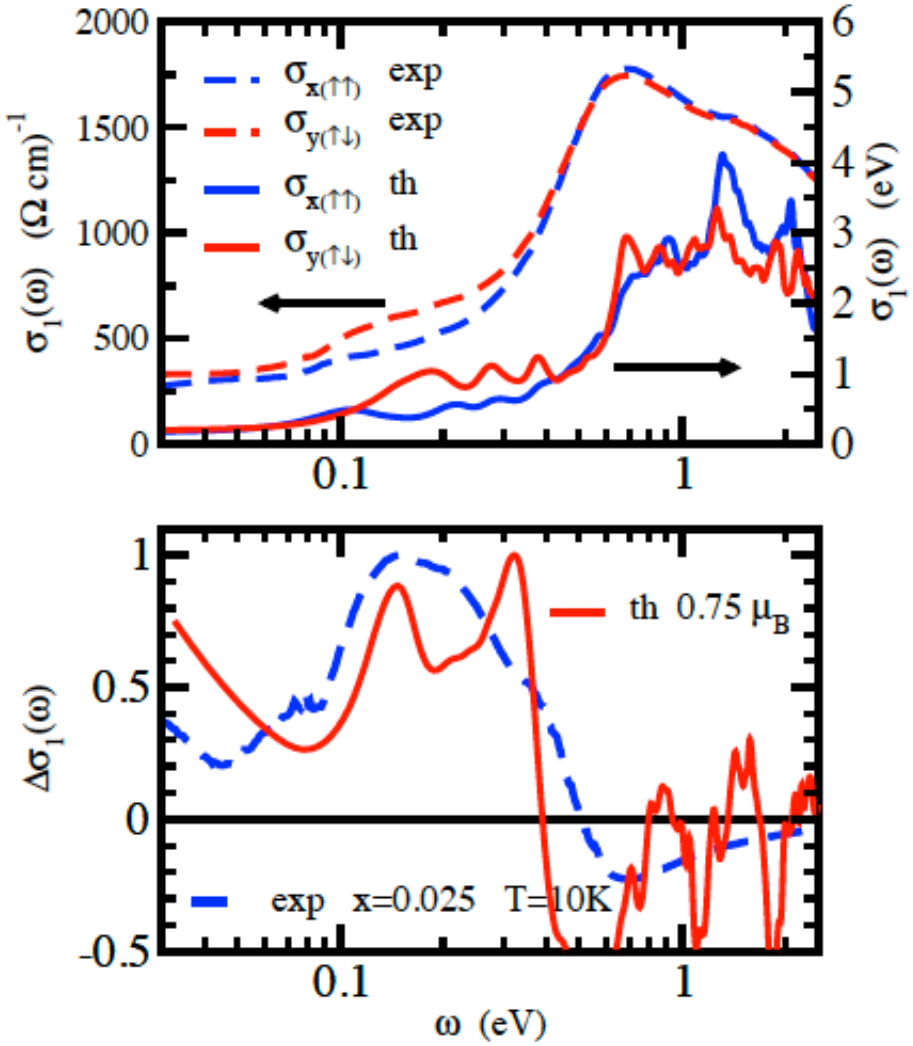
Yi et al., cond-mat/1011.0050

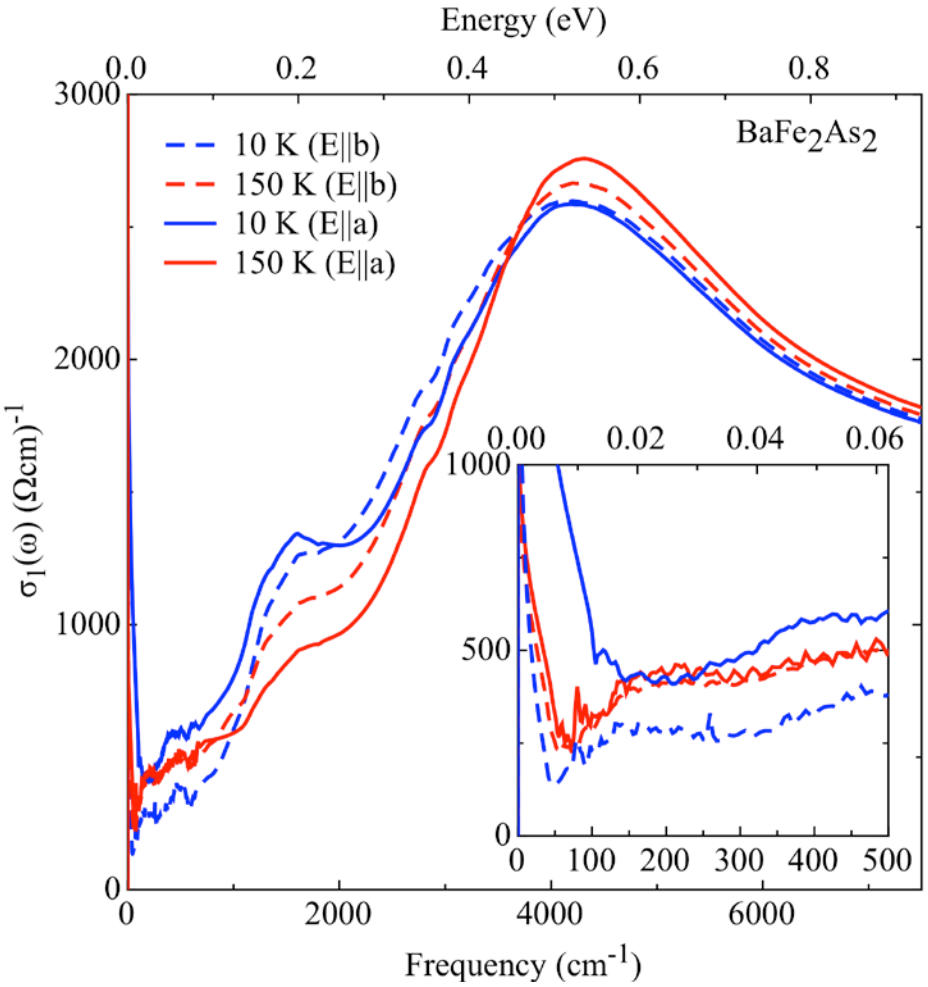
Sample Mounting with Clamp to Adjust Uni-Axial Pressure





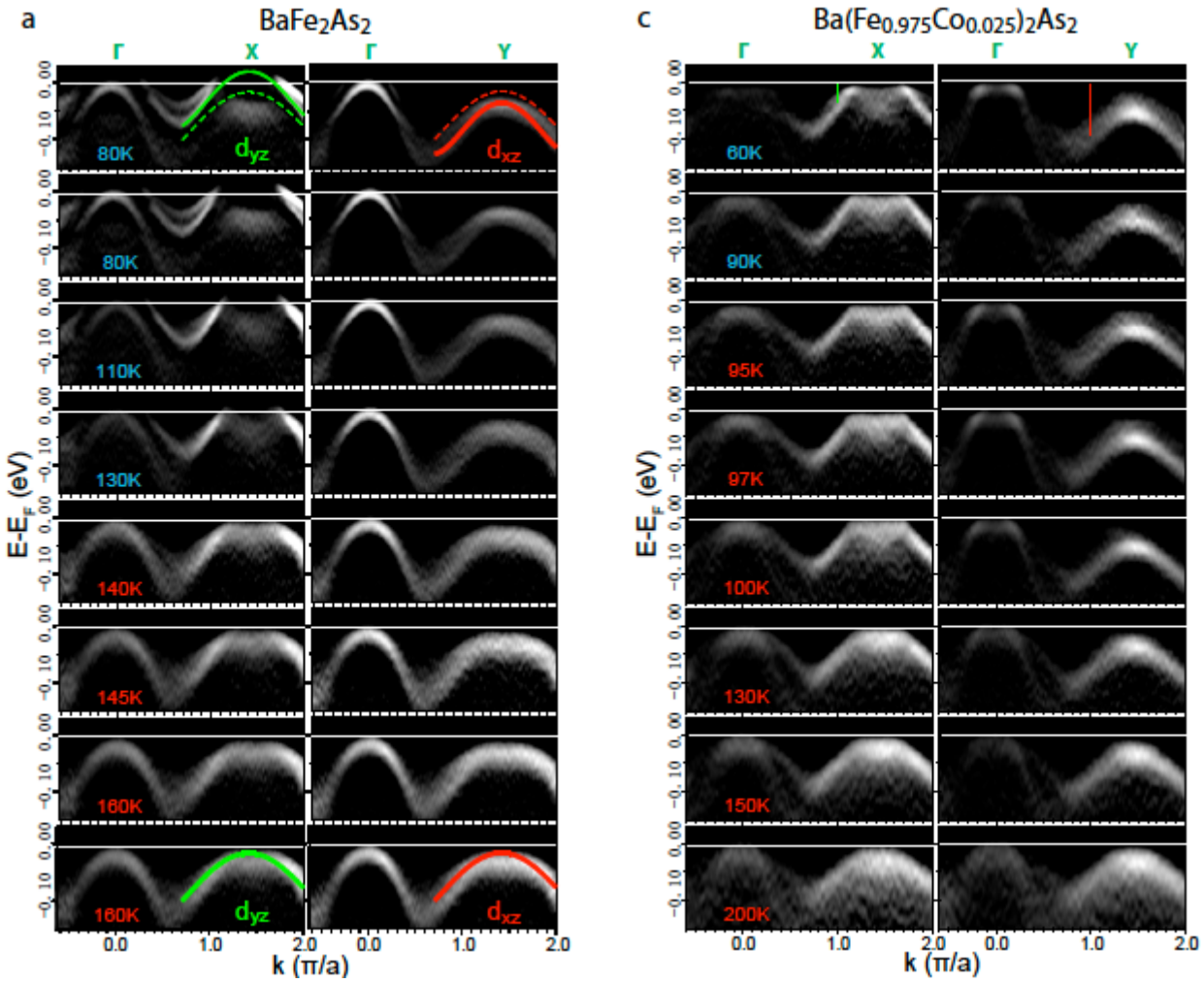
Optical Properties in Detwinned 122-Compounds (x=0%)

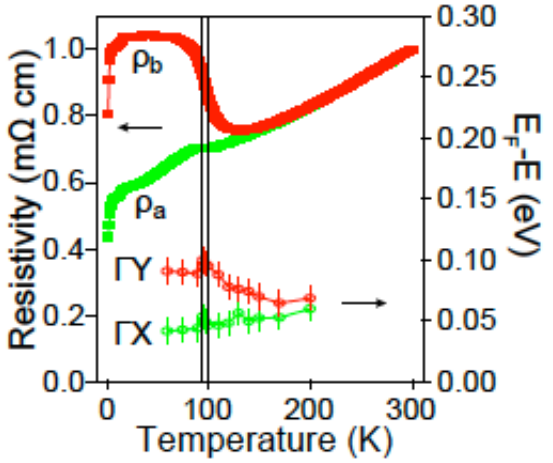




Sanna et al., cond-mat/1010.0220

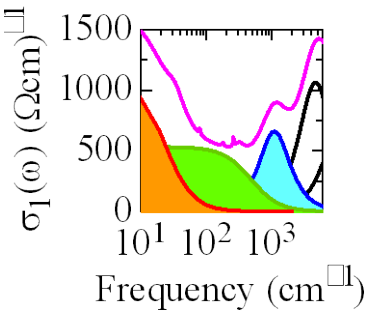
Temperature Dependence of Electronic Structure on Detwinned $Ba(Fe_{1-x}Co_x)_2As_2$

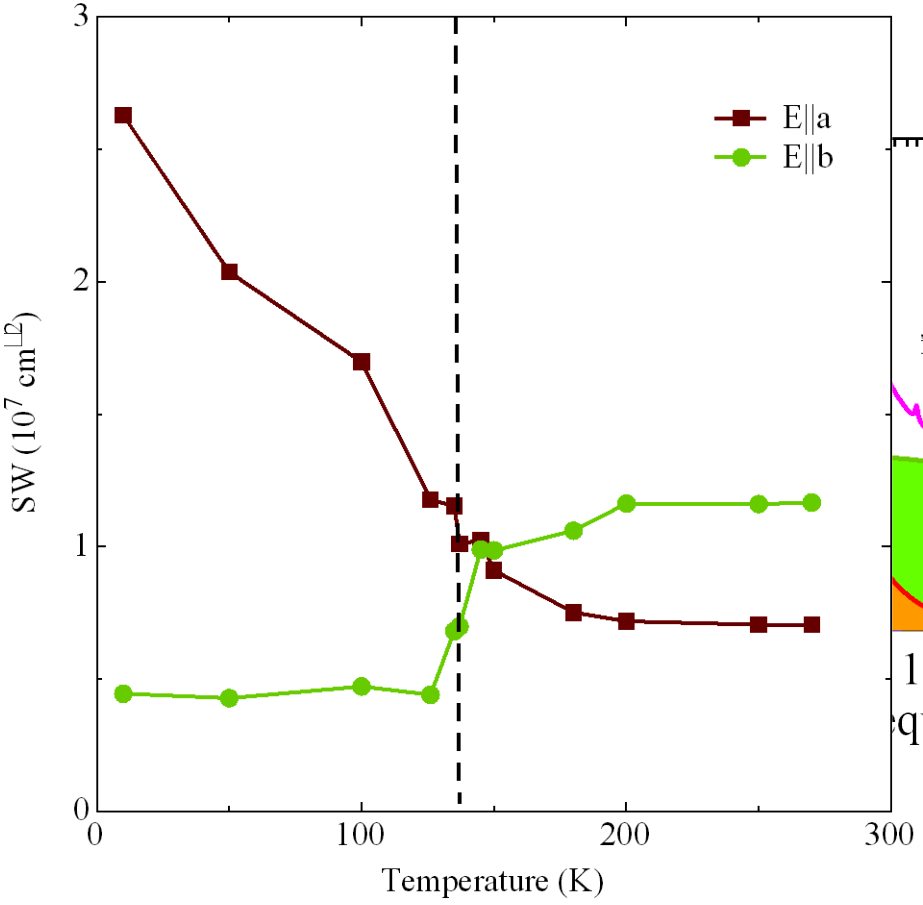


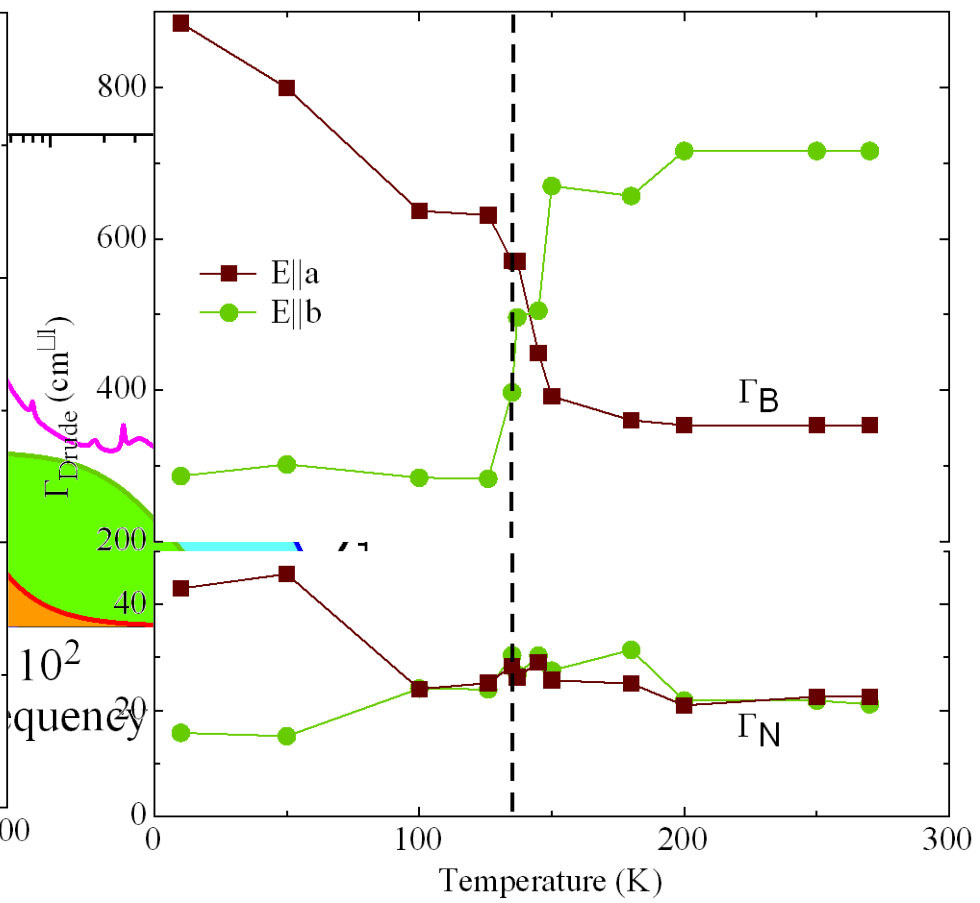


Yi et al., cond-mat/1011.0050

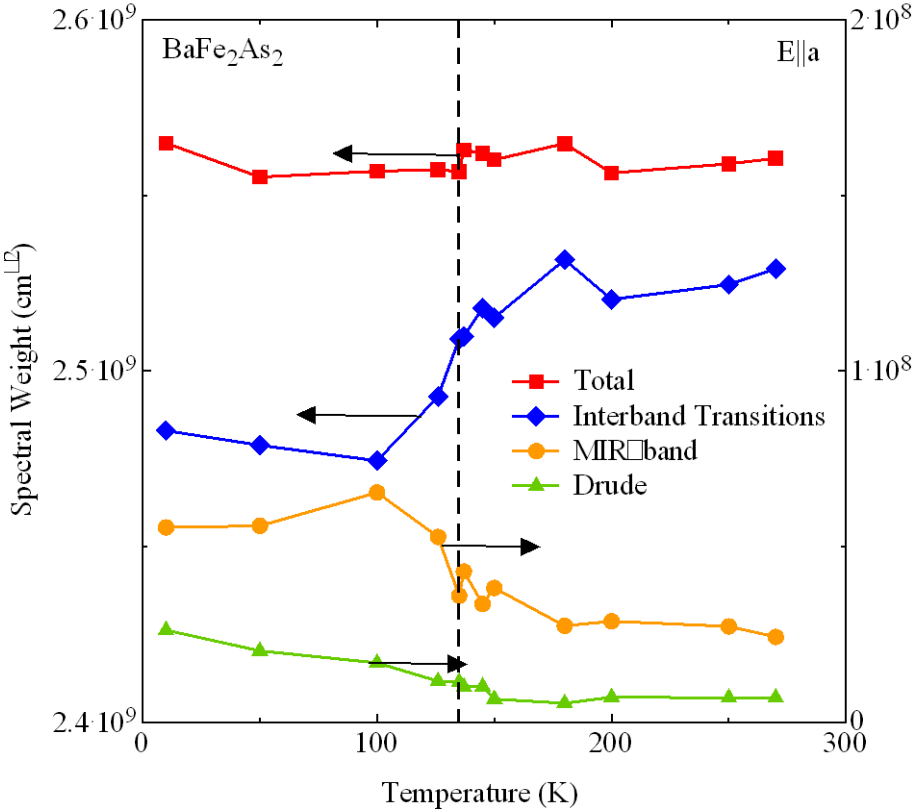
Drude Weight and Scattering Rate in Detwinned 122-Compounds (x=0%)

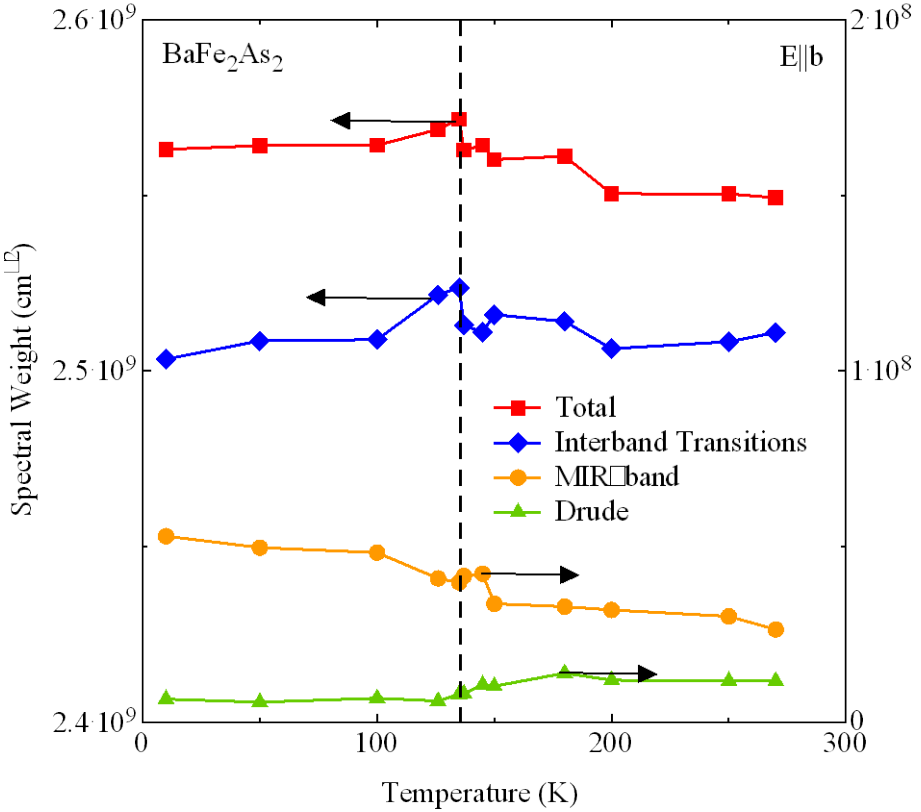




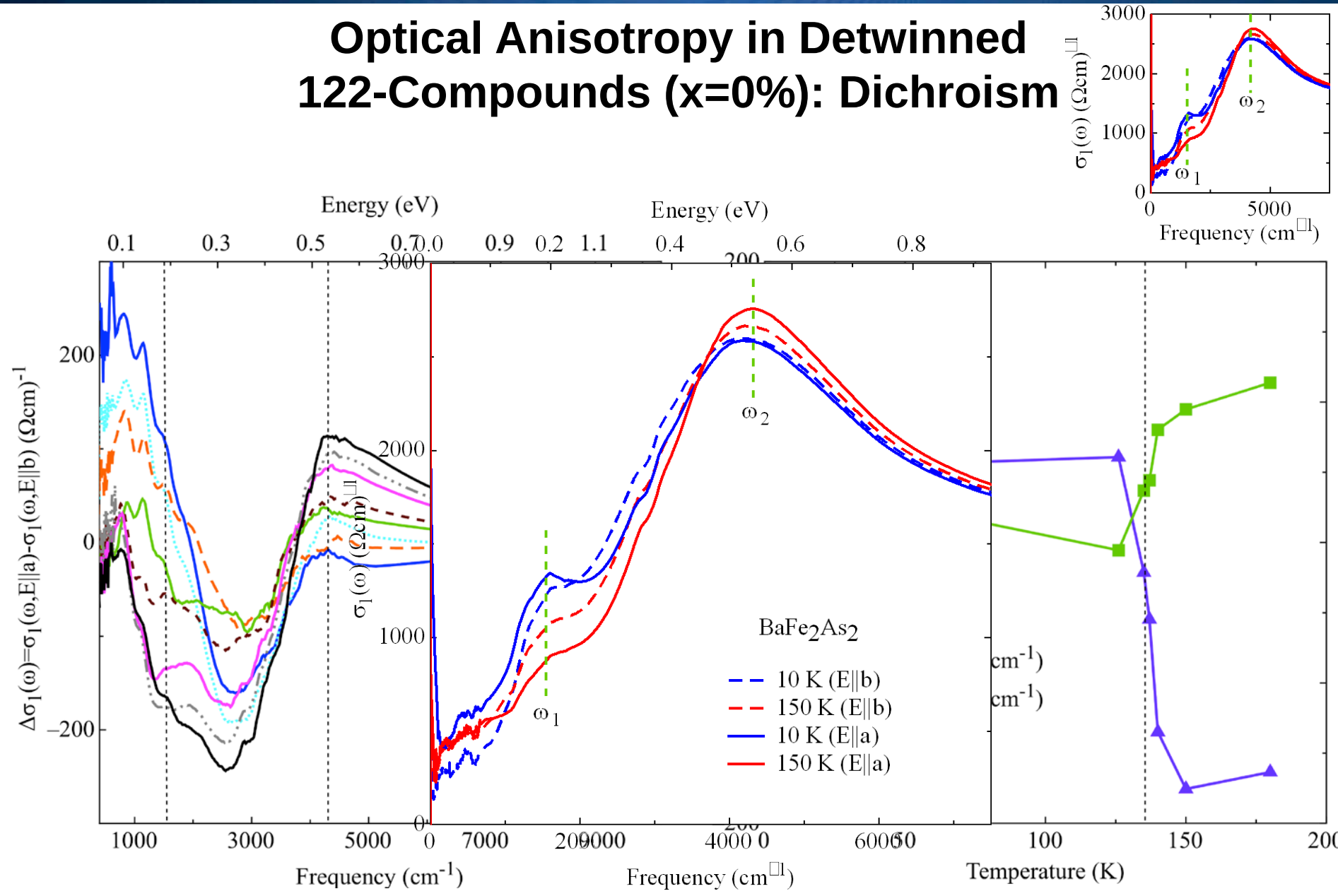


Spectral Weight Distribution in Detwinned 122-Compounds (x=0%)

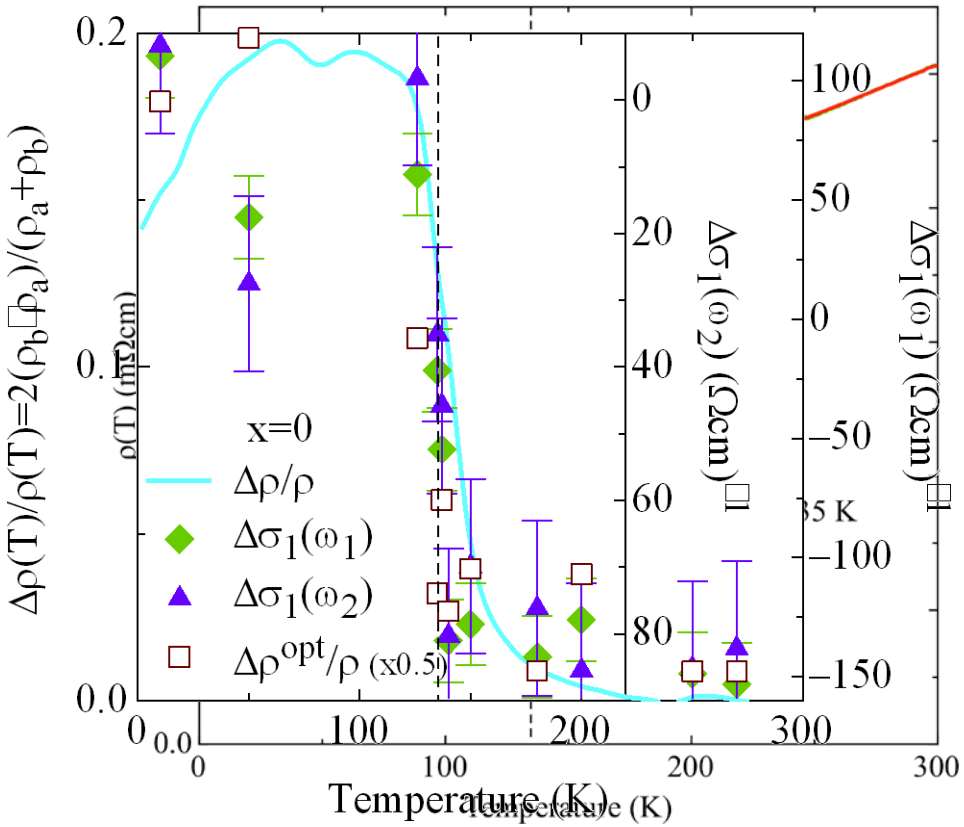


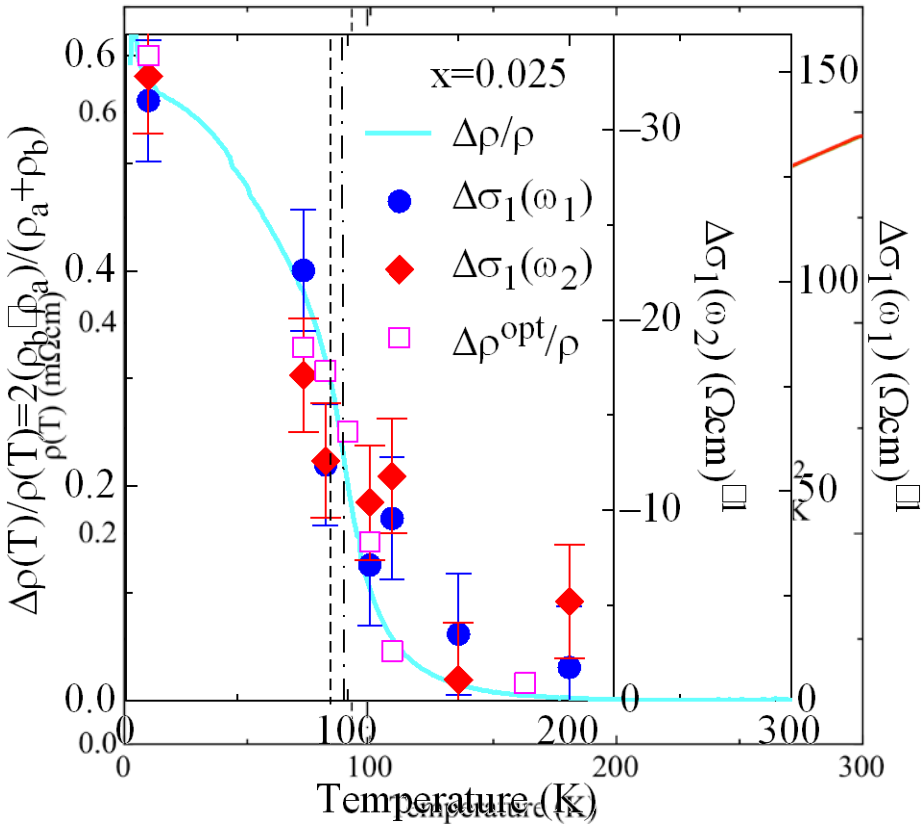


Optical Anisotropy in Detwinned 122-Compounds (x=0%): Dichroism



Dichroism versus DC Resistivity Anisotropy in Detwinned 122-Compounds

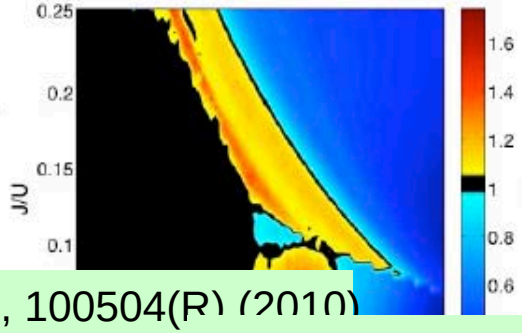




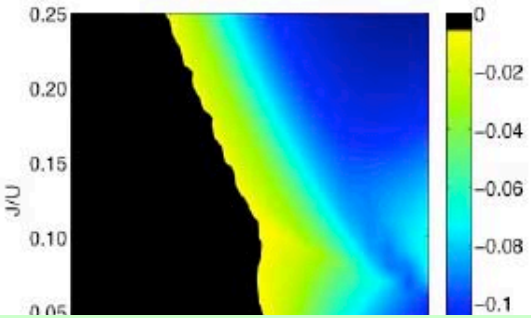
Orbital Order versus Nematic Phase Scenario

Magnetic Phase Diagram

Drude Ratio (a/b)

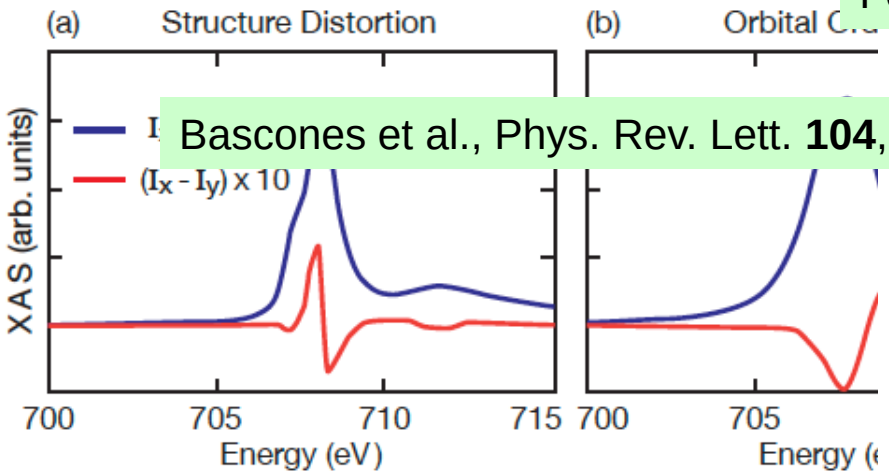


Orbital Ordering

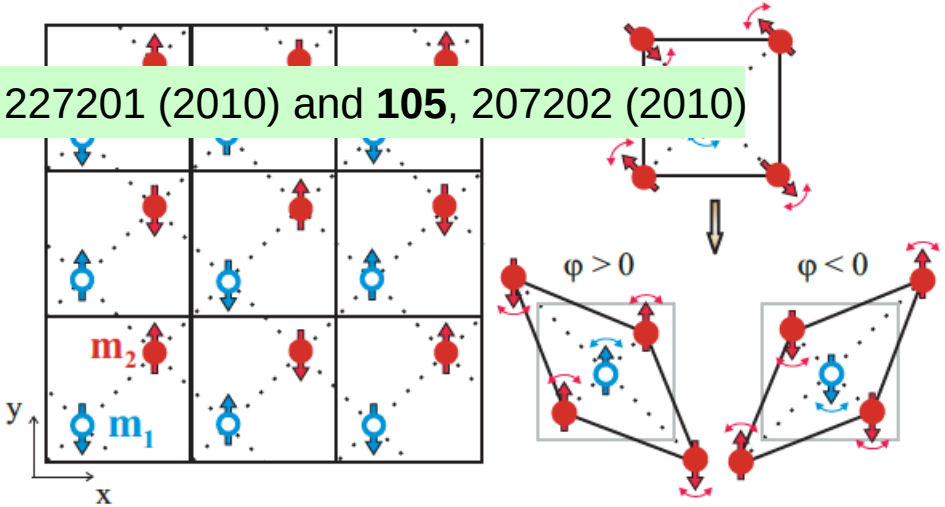


Chen et al., Phys. Rev. B **82**, 100504(R) (2010)

Fernandes et al., Phys. Rev. Lett. **105**, 157003 (2010)



Bascones et al., Phys. Rev. Lett. **104**, 227201 (2010) and **105**, 207202 (2010)

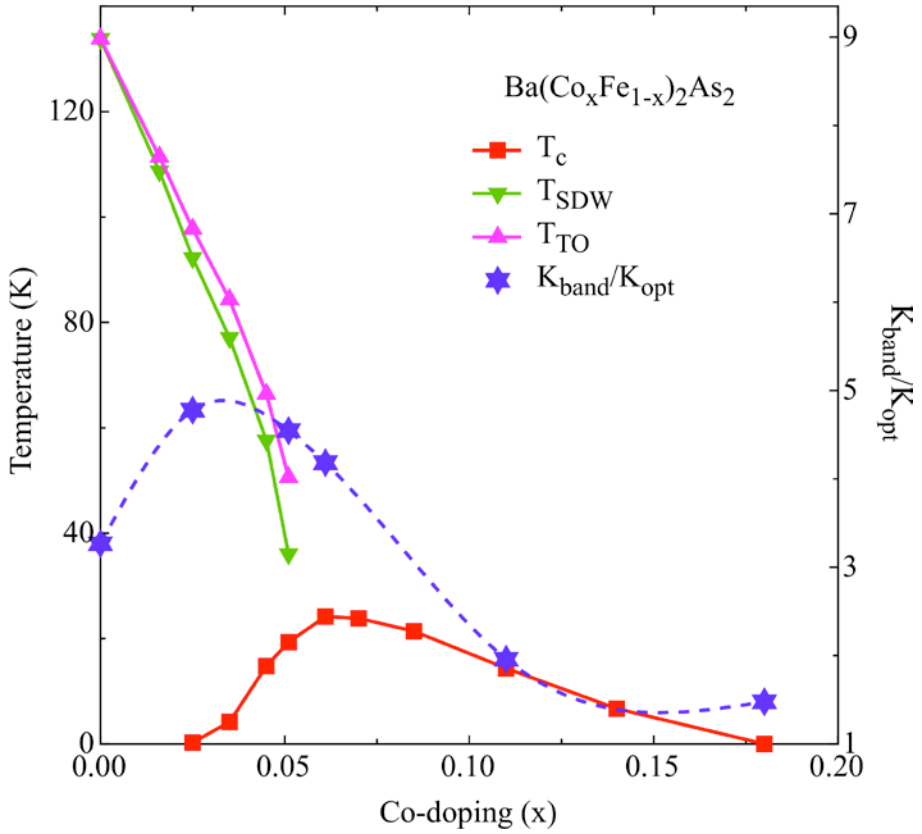


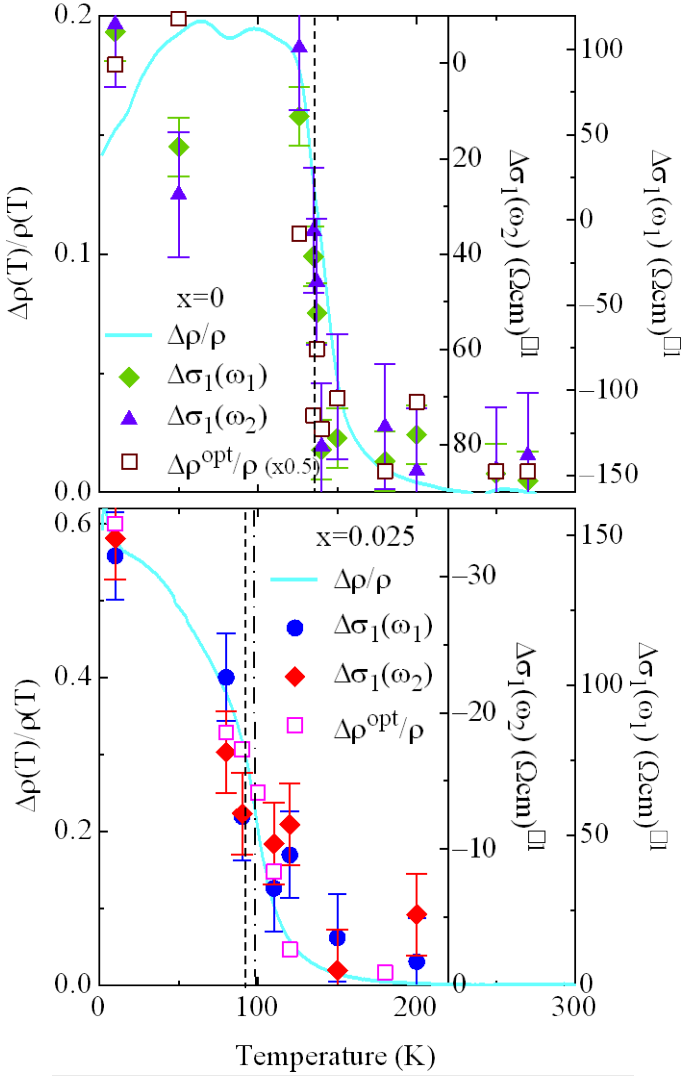
Unequal d_{xz}/d_{yz} orbital populatio
leading to Fermi surface reconstruction
and linear dichroism

Spin ordering results in emergent
nematic degrees of freedom

Summary and Conclusions

Strength of Electronic Correlation





Dichroism and DC Anisotropy

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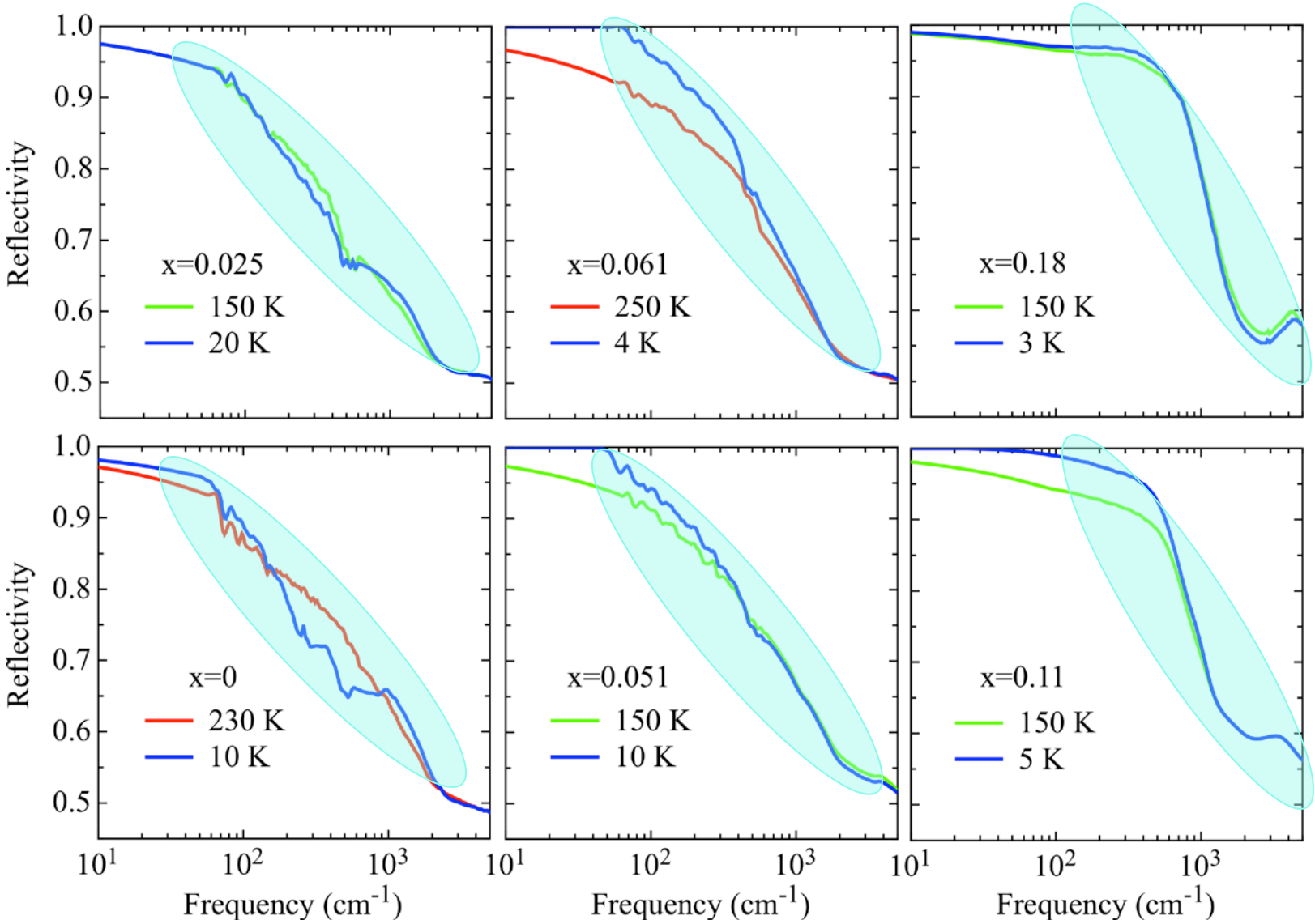
J.G. Analytis
J.-H. Chu
(Stanford University)

FNSNF

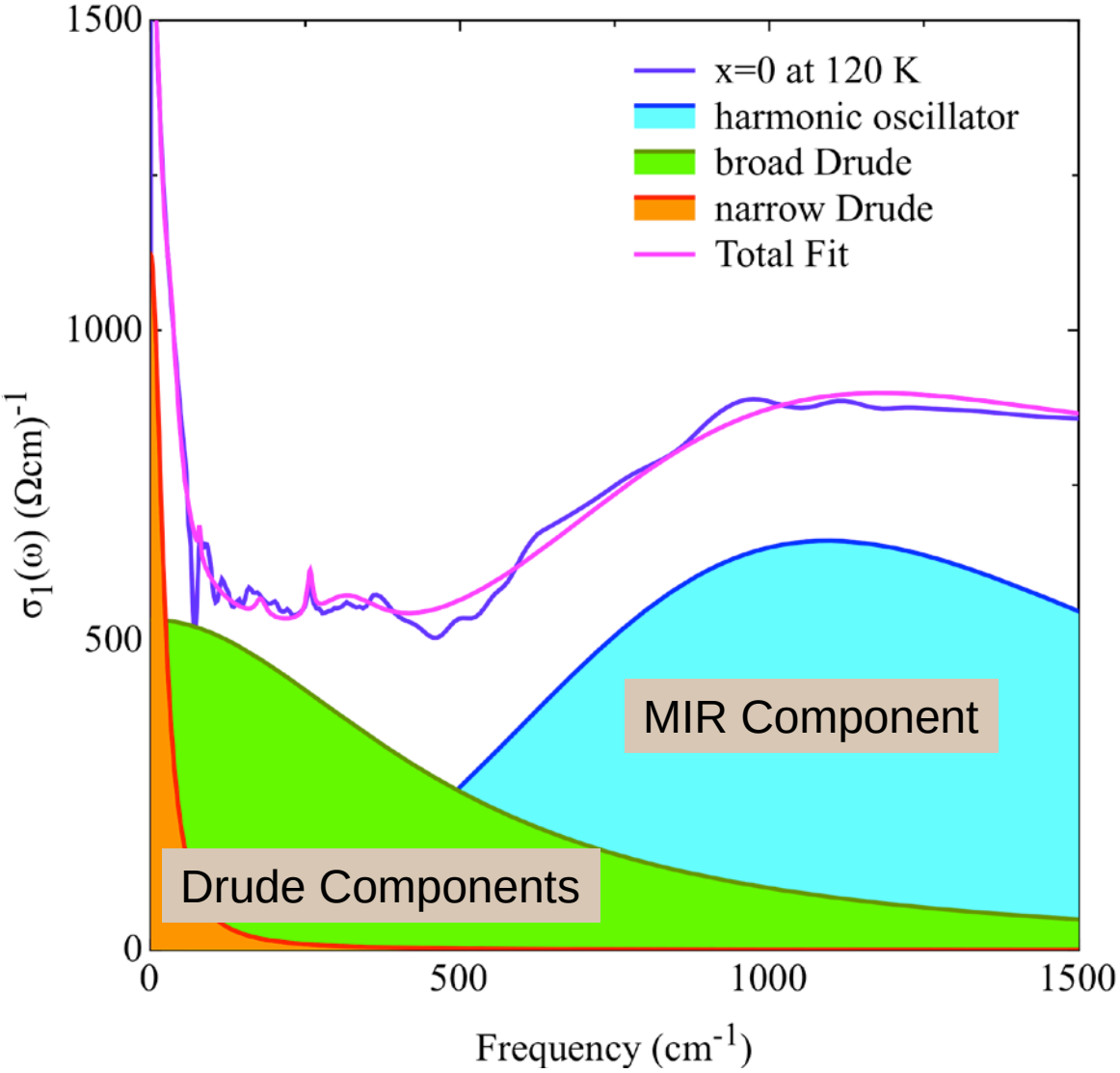
MaNEP
SWITZERLAND

Thank You
for Your Attention

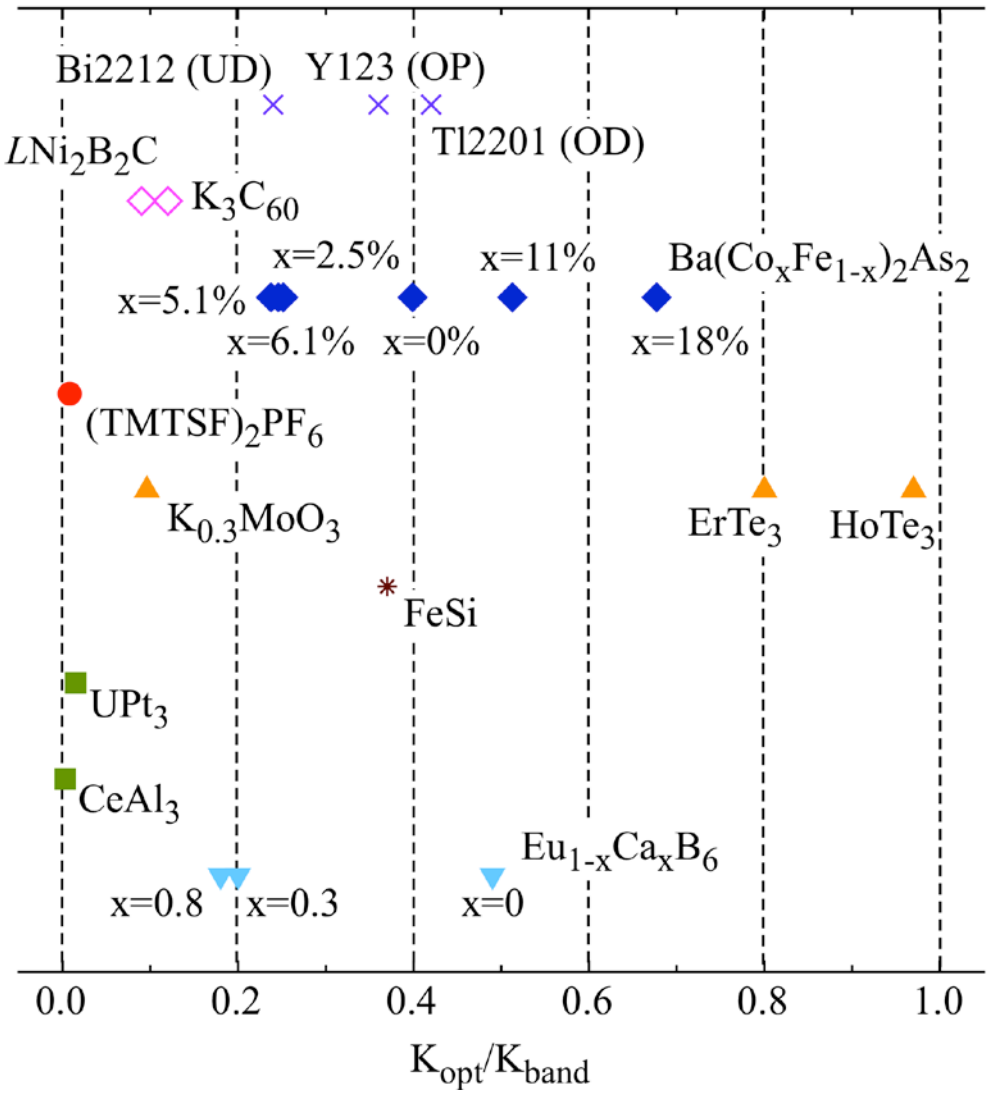
Optical Reflectivity of $Ba(Co_xFe_{1-x})_2As_2$

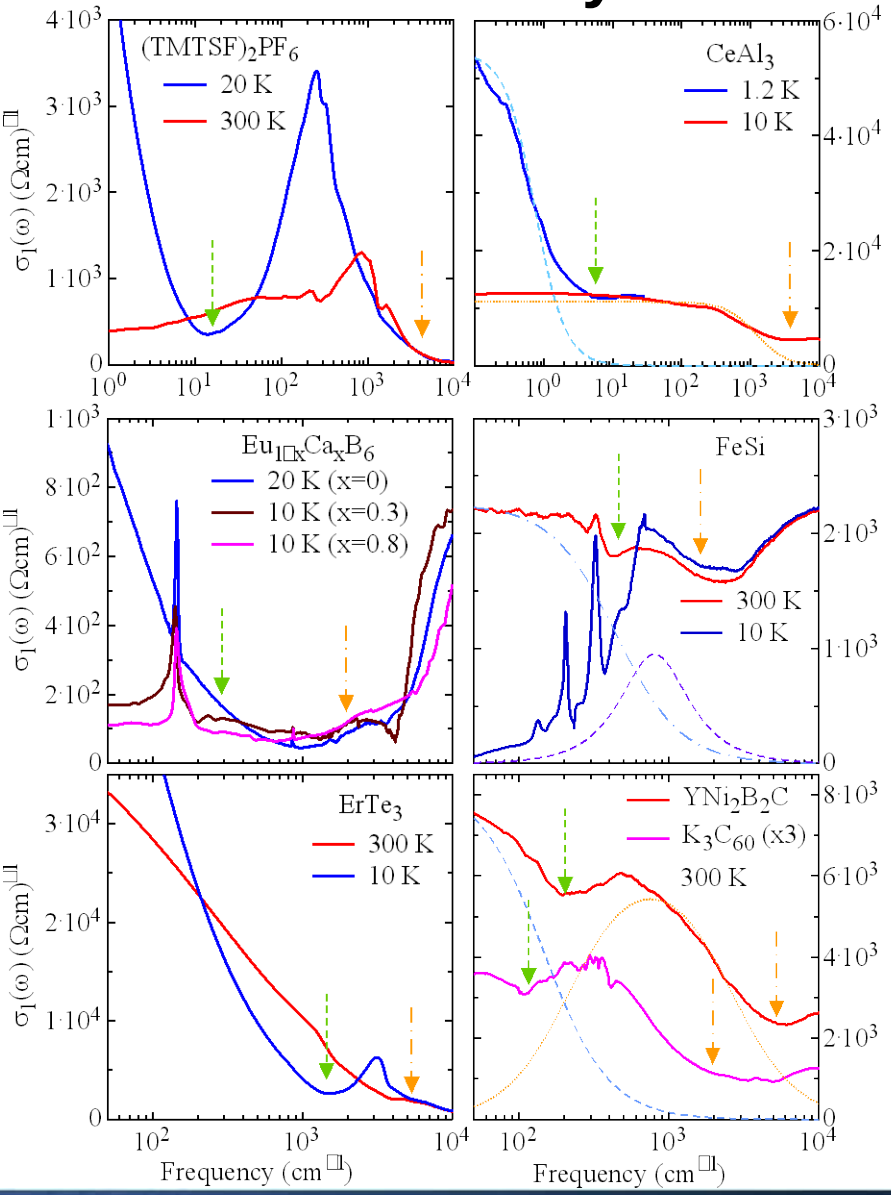


Drude and MIR Components in the Optical Conductivity

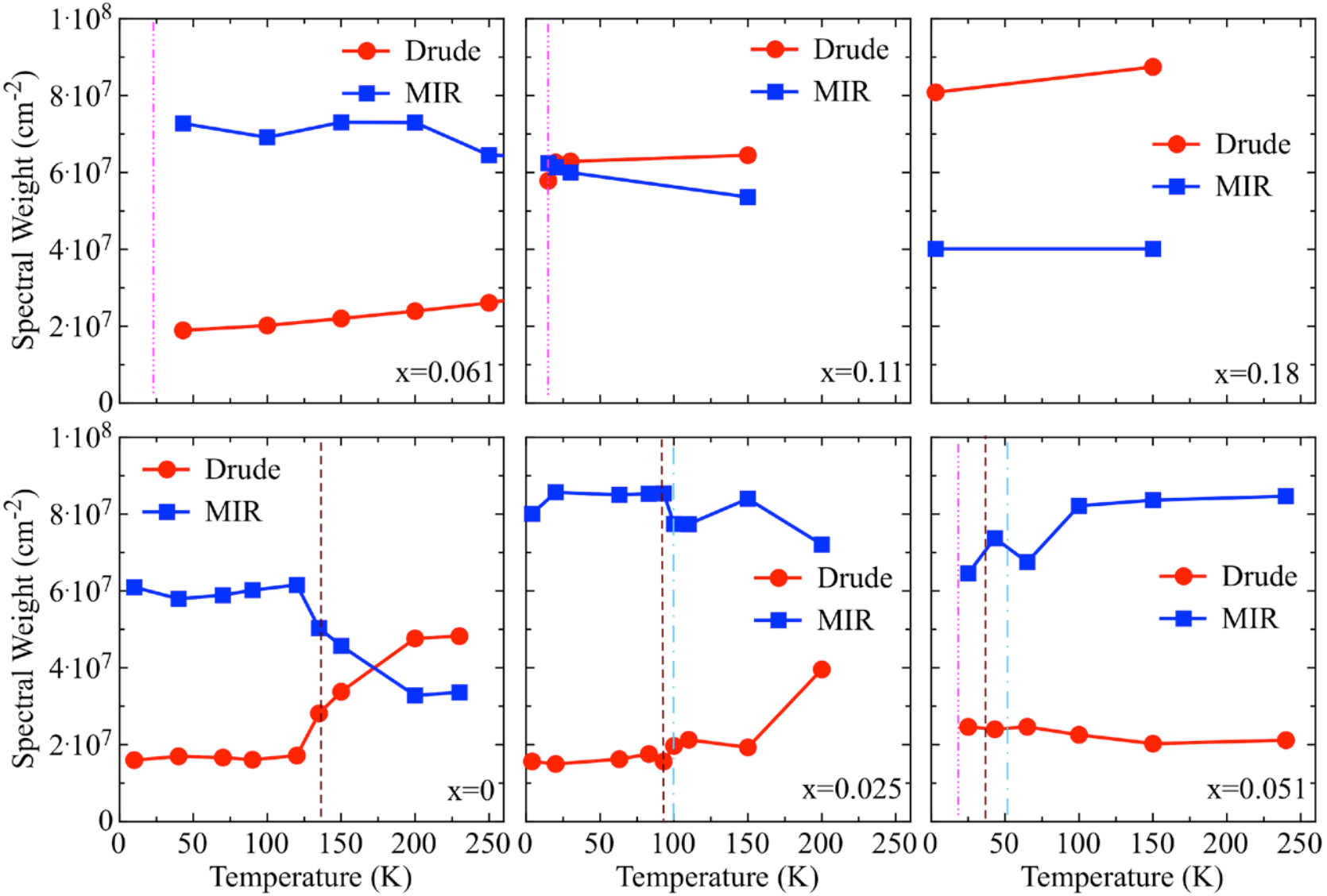


Electronic Correlations in Iron-Pnictides and Beyond

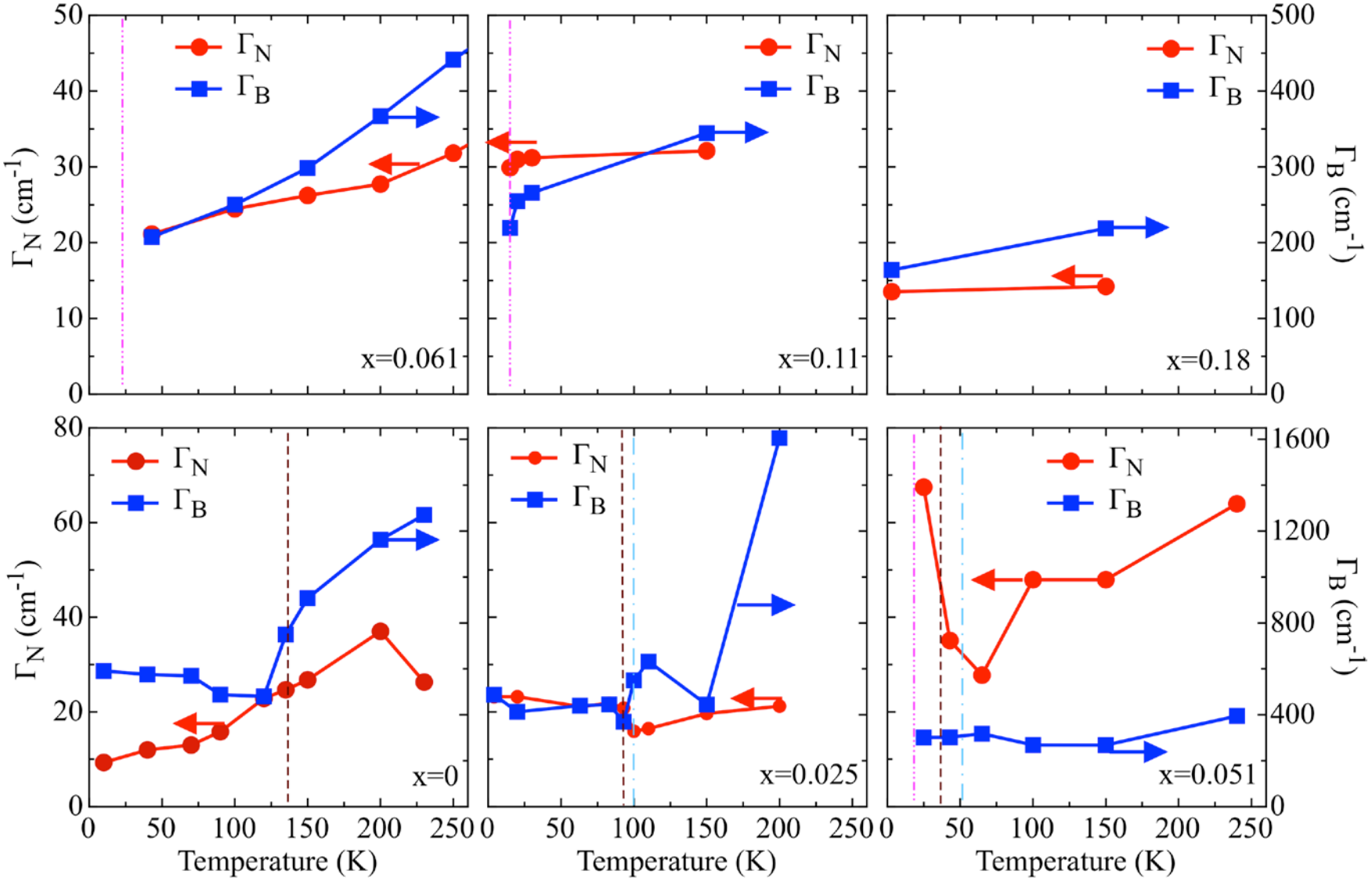




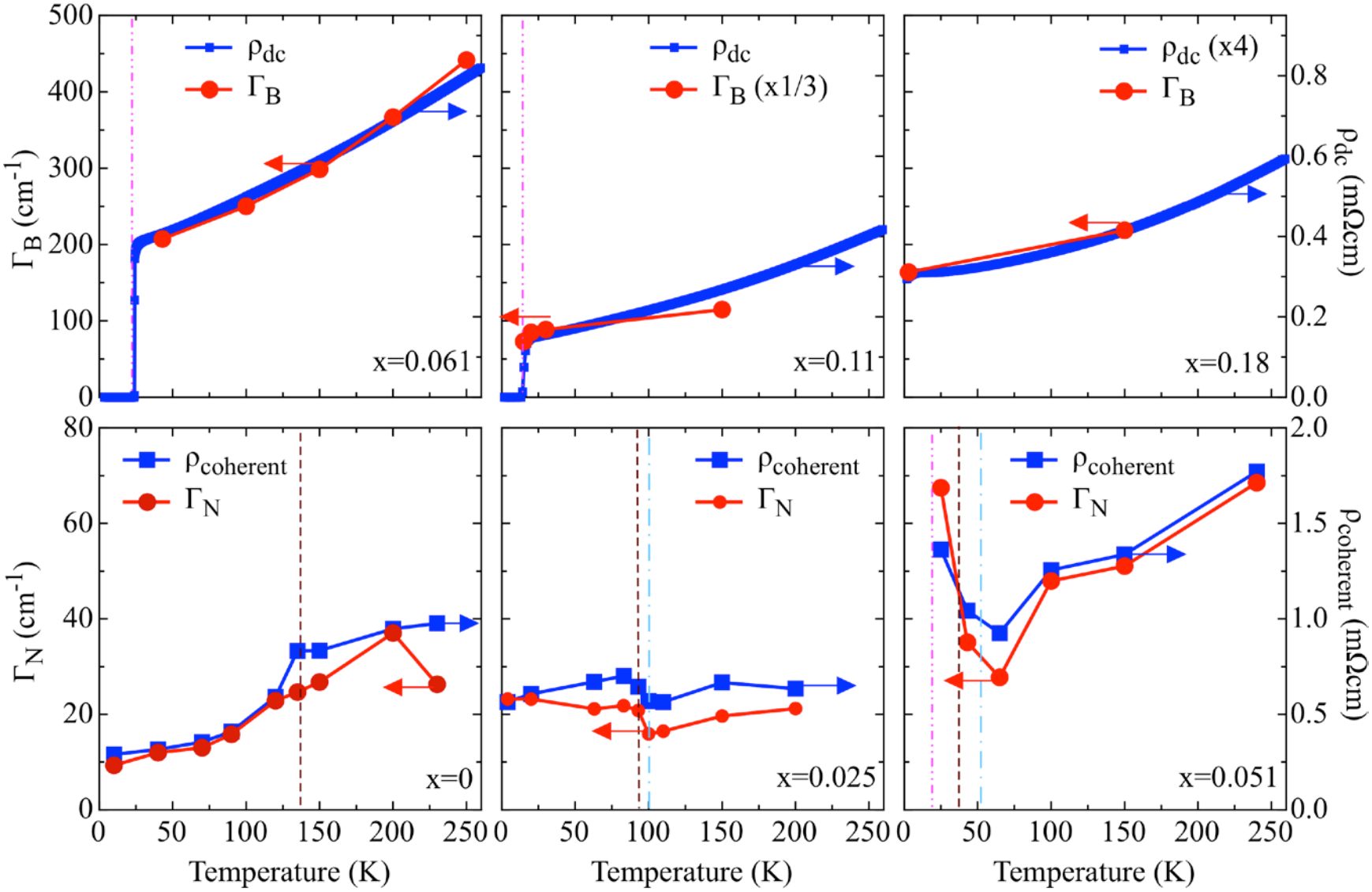
Spectral Weight Distribution among Drude and MIR Components



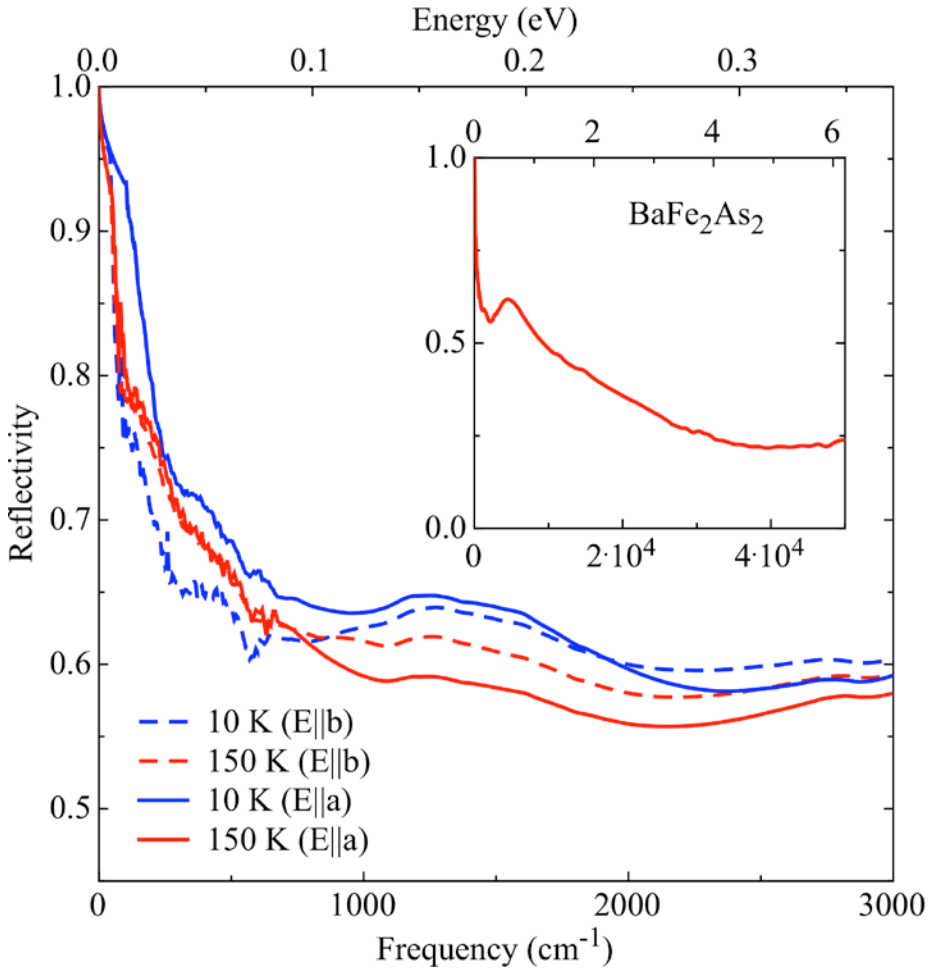
Drude Scattering Rates

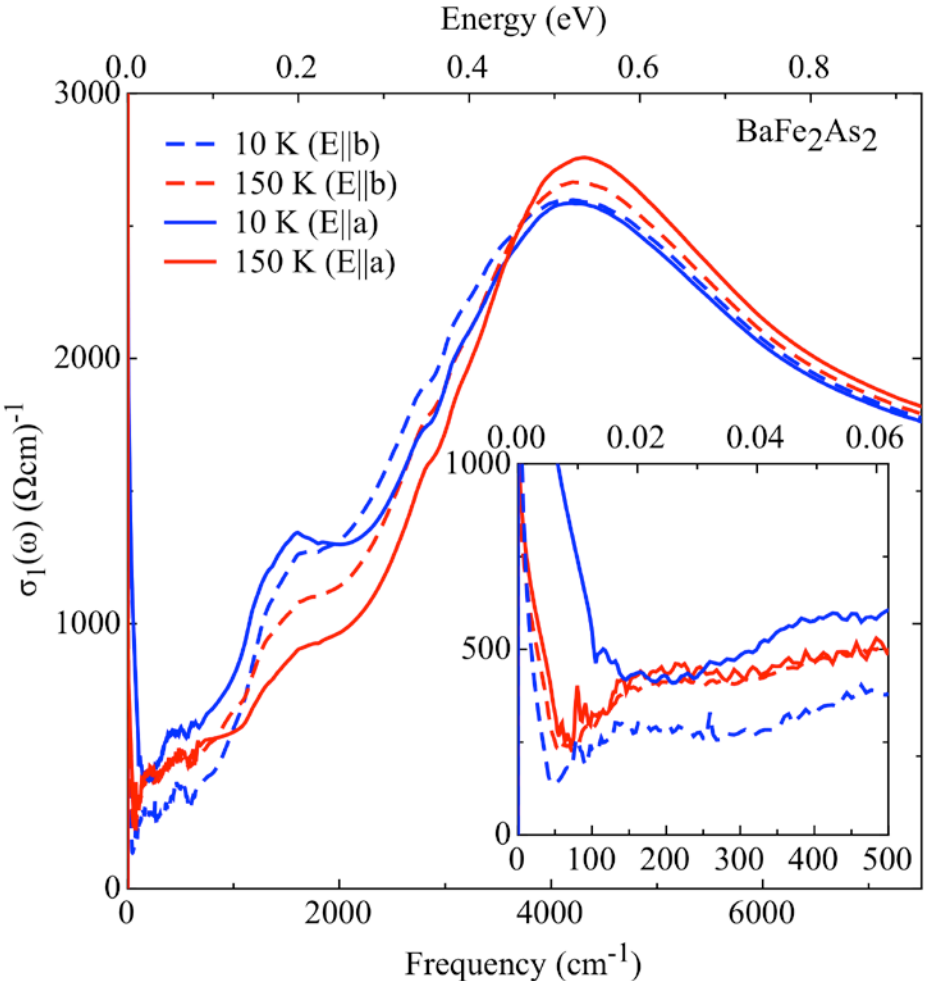


Drude Scattering Rates versus DC Transport Properties



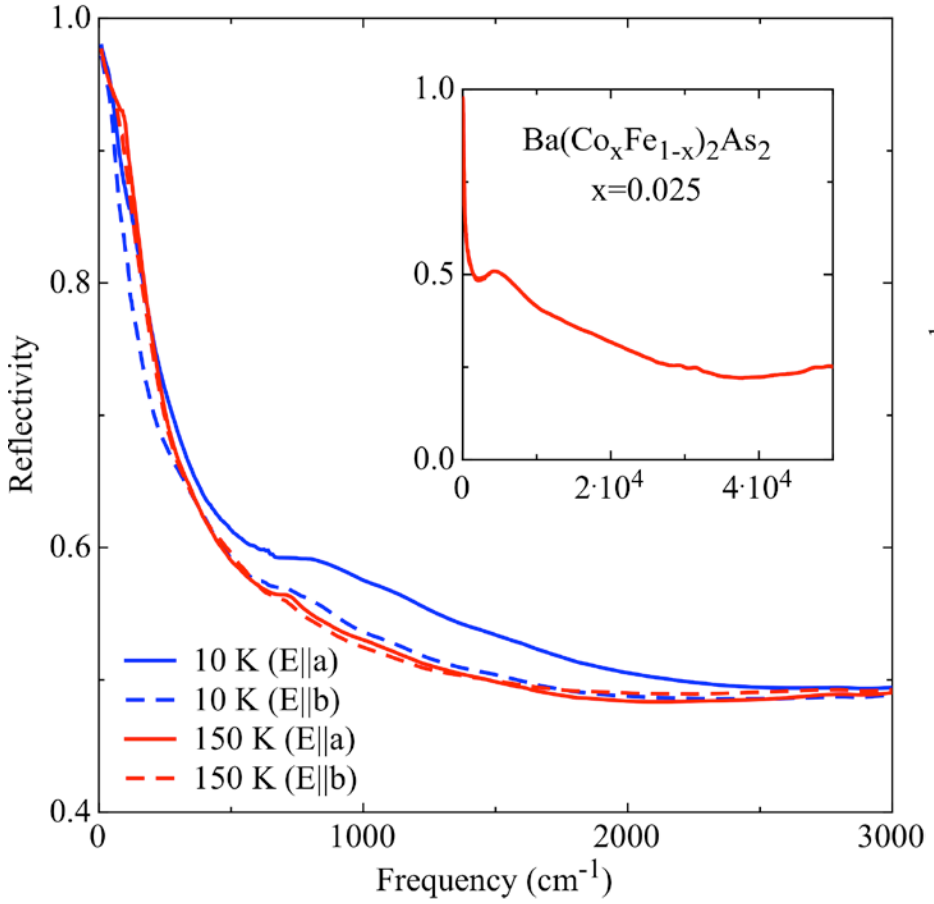
Optical Properties in Detwinned 122-Compounds (x=0%)

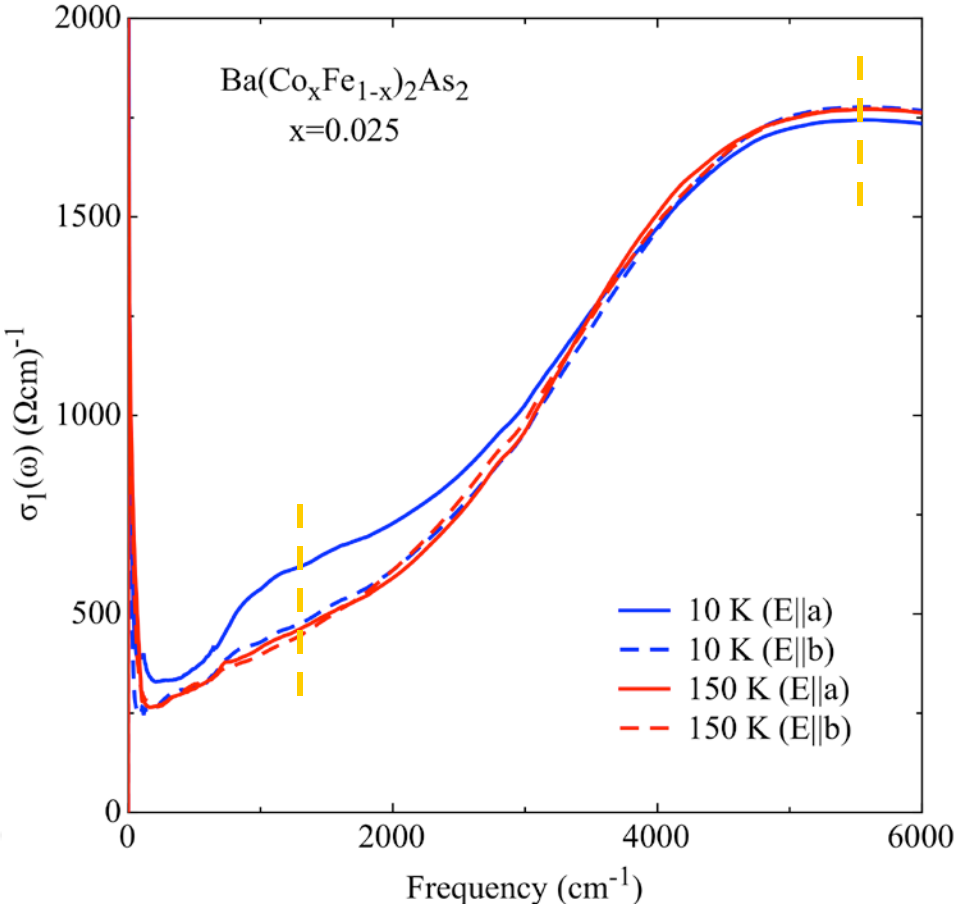




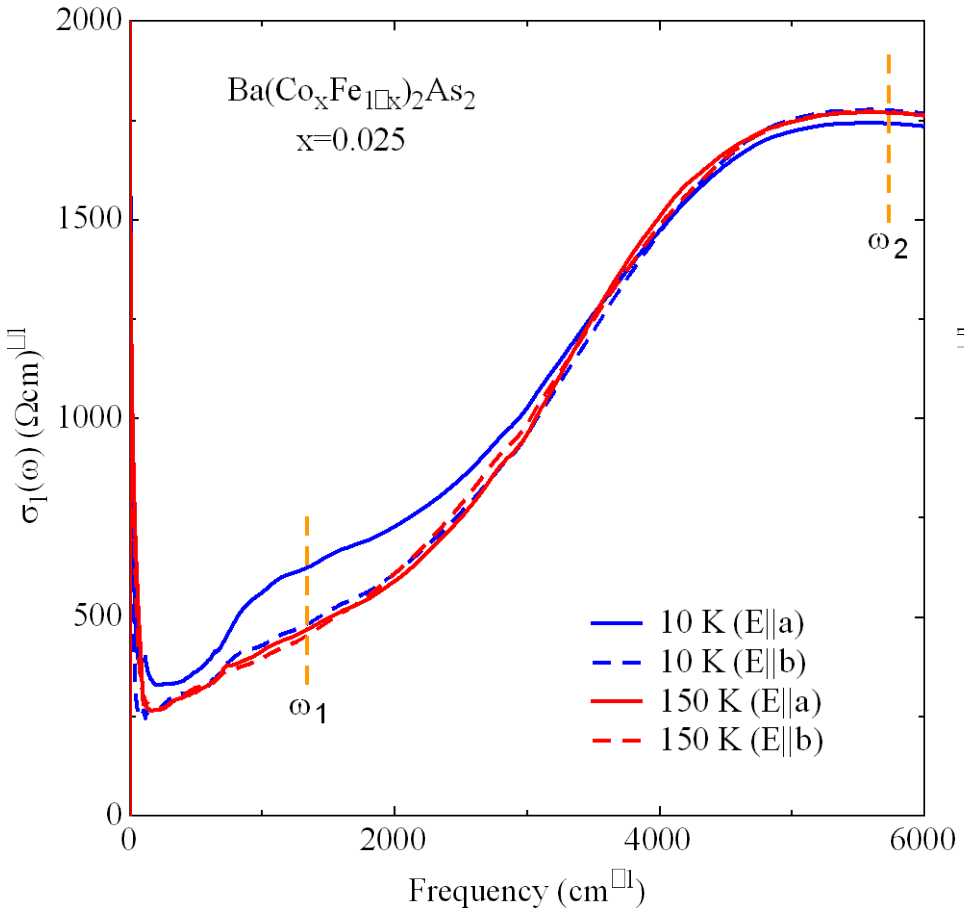
Sanna et al., cond-mat/1010.0220

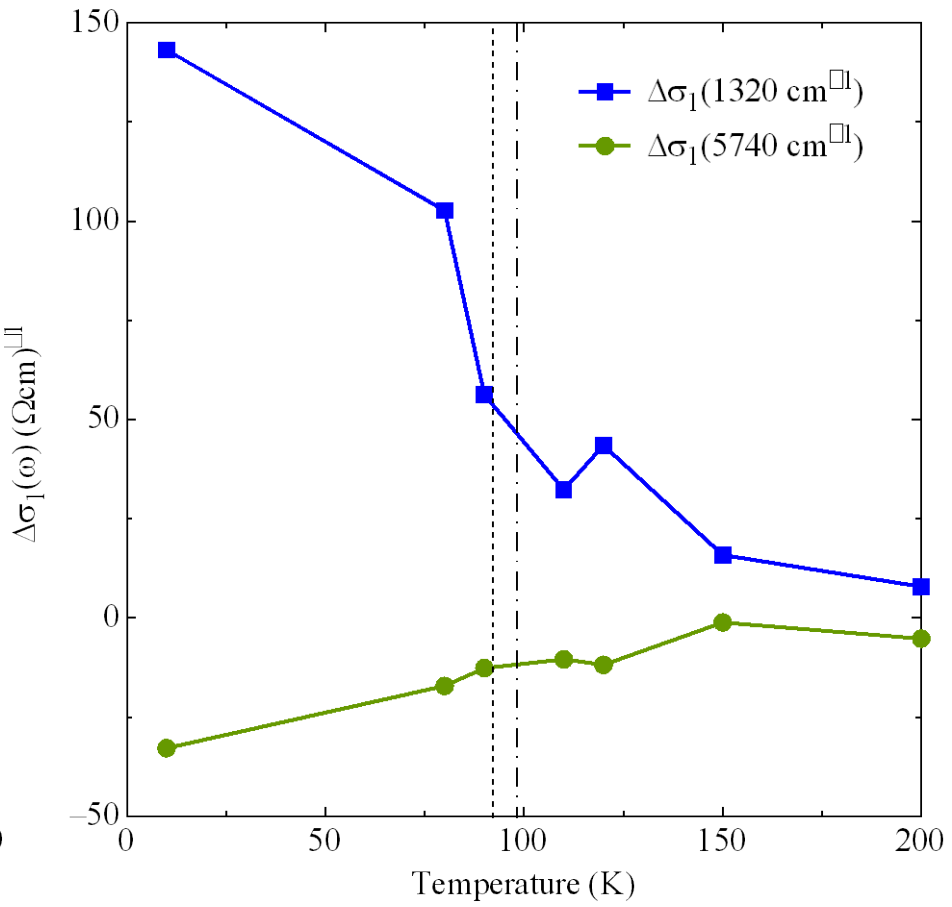
Optical Properties in Detwinned 122-Compounds (x=2.5%)



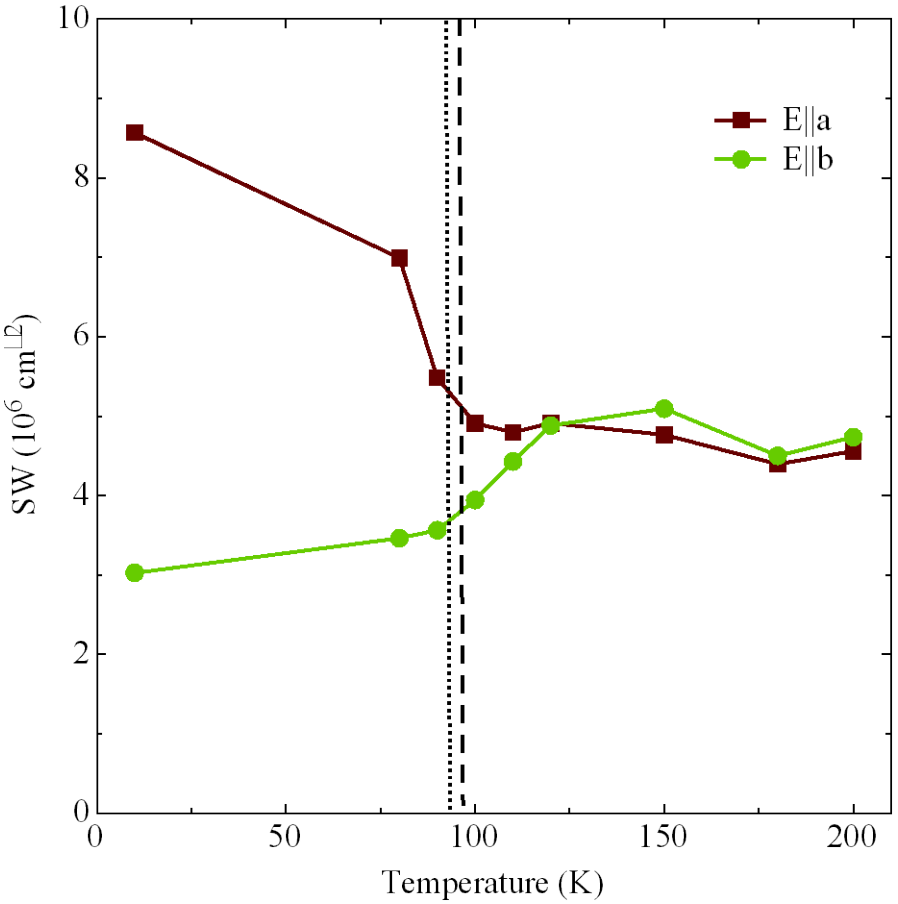


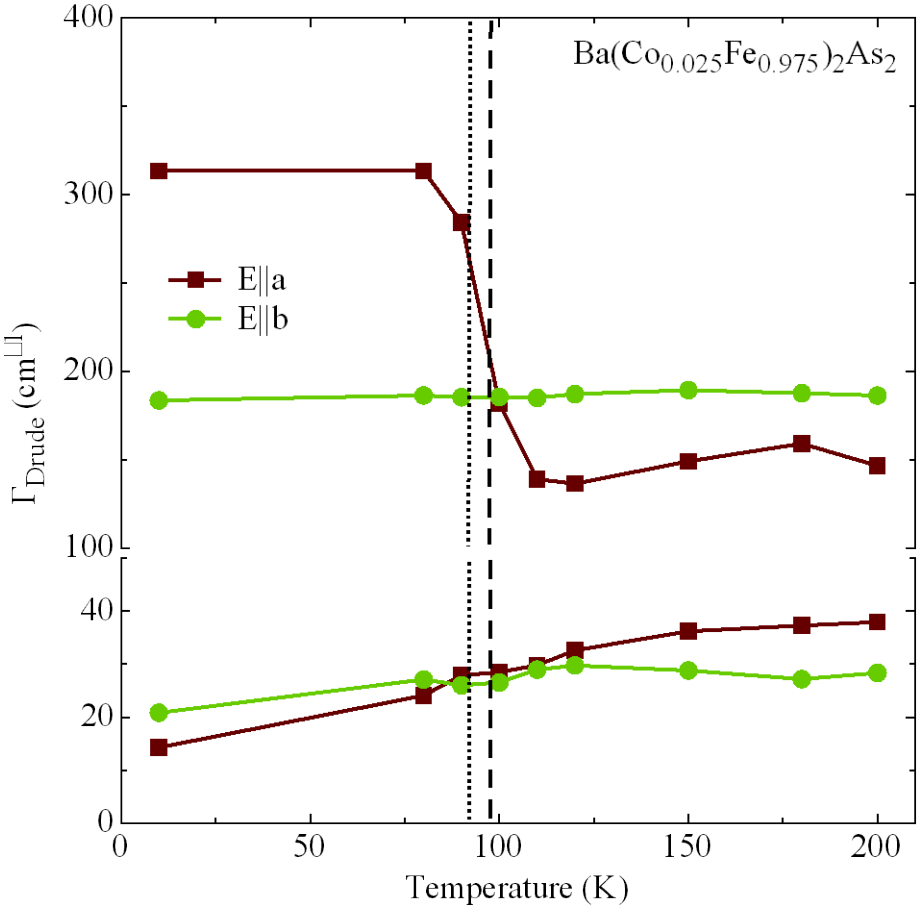
Optical Anisotropy in Detwinned 122-Compounds (x=2.5%): Dichroism



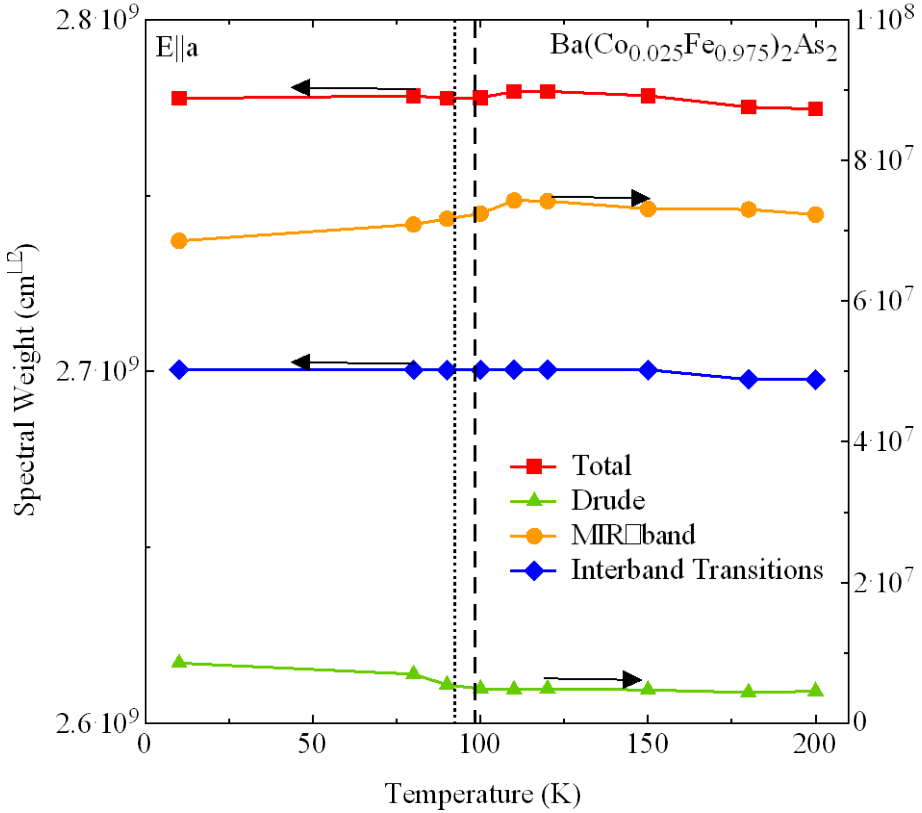


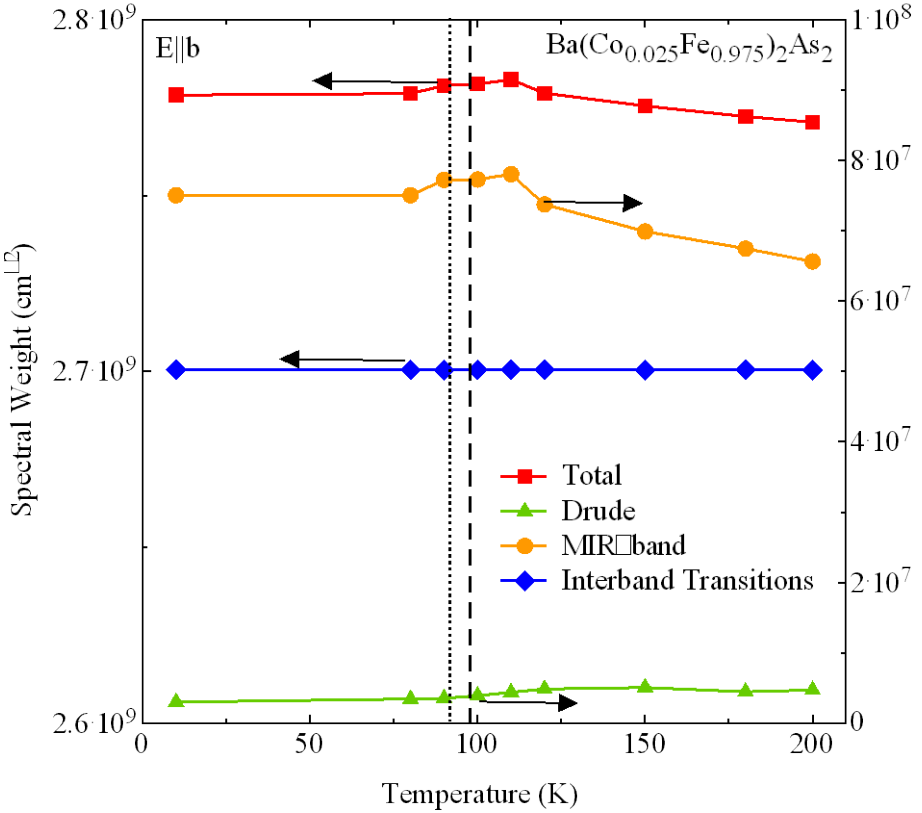
Drude weight and Scattering Rate in Detwinned 122-Compounds (x=2.5%)



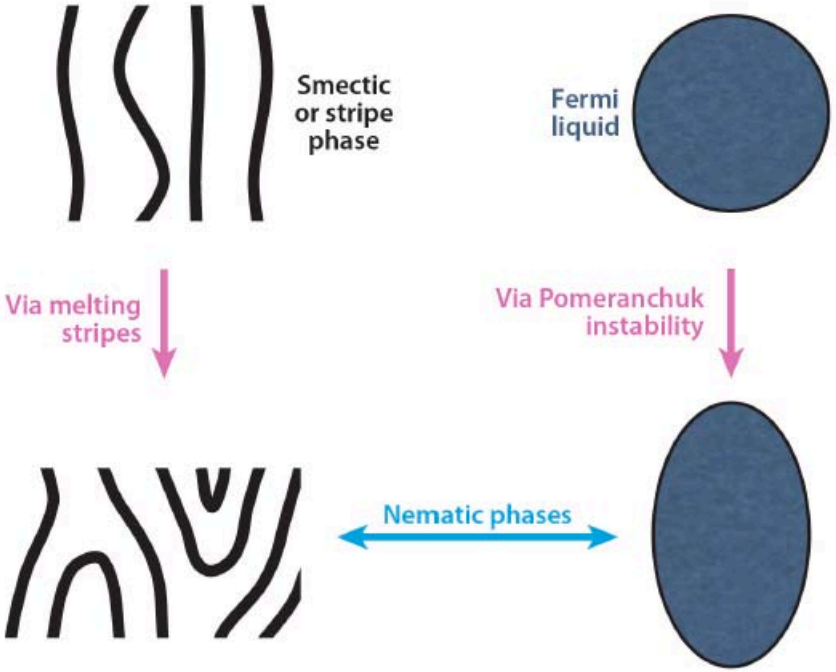


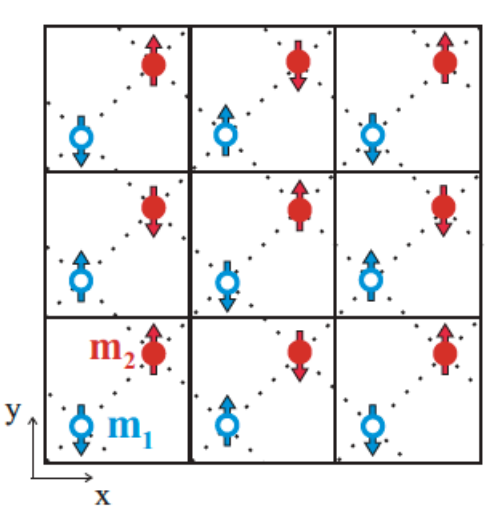
Spectral Weight Distribution in Detwinned 122-Compounds (x=2.5%)

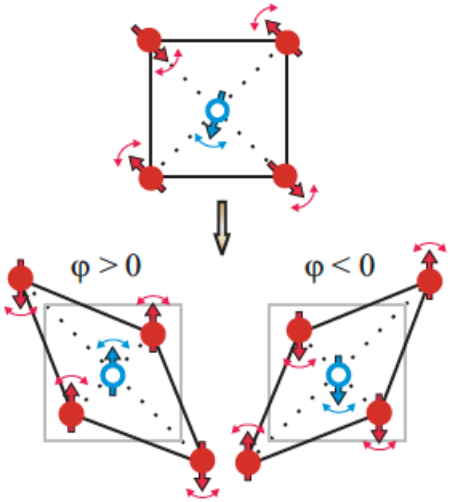




Nematic Phase: Structural Order from Magnetic Fluctuations



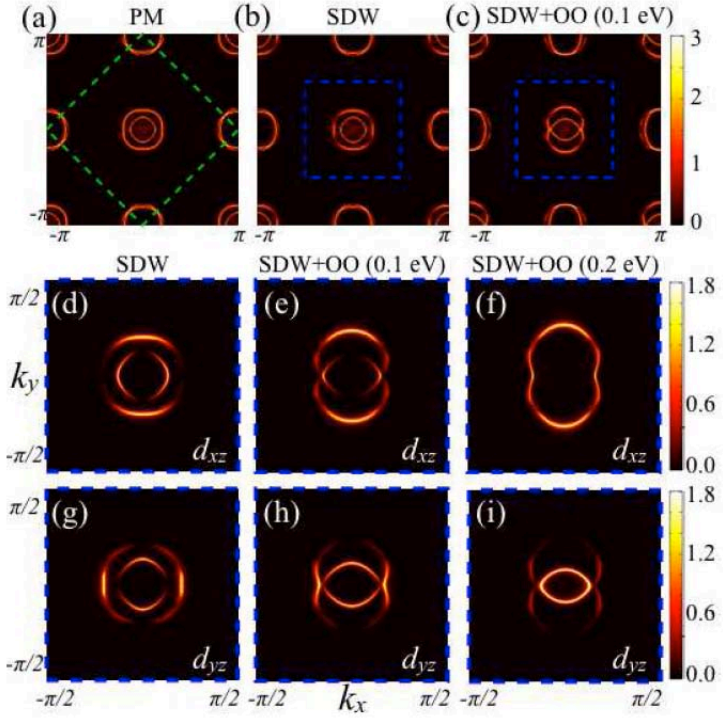


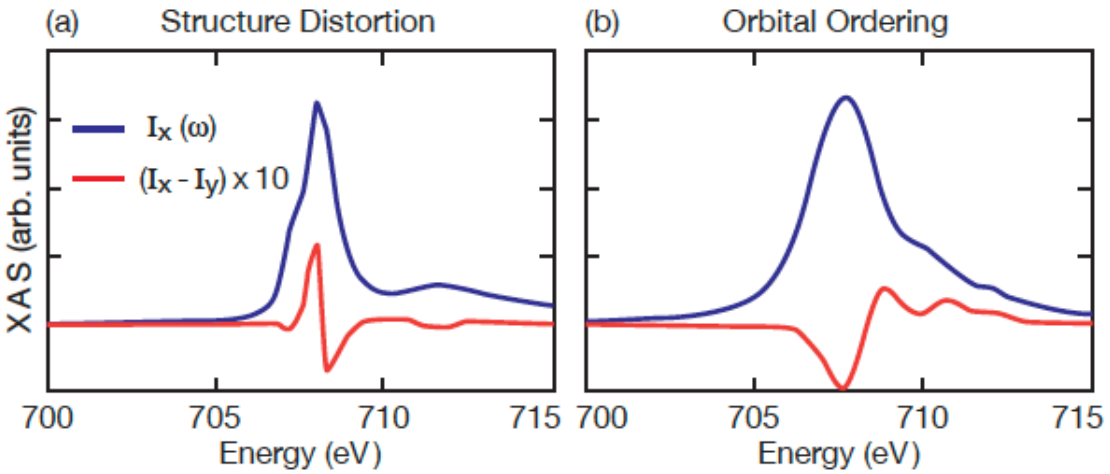


Spin ordering results in emergent nematic degrees of freedom

E. Fradkin et al., cond-mat/0910.4166 and Fernandes et al., Phys. Rev. Lett. **105**, 157003 (2010)

Orbital Order: Linear Dichroism in X-Ray Absorption



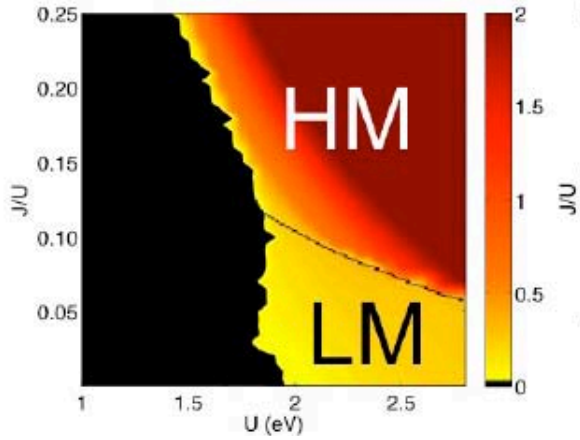


Unequal d_{xz}/d_{yz} orbital population leading to Fermi surface reconstruction and linear dichroism

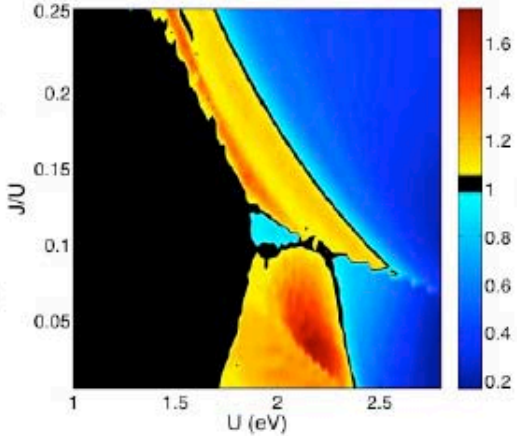
Chen et al., Phys. Rev. B **82**, 100504(R) (2010)

Role of Orbital Order in Anisotropy of the Magnetic State

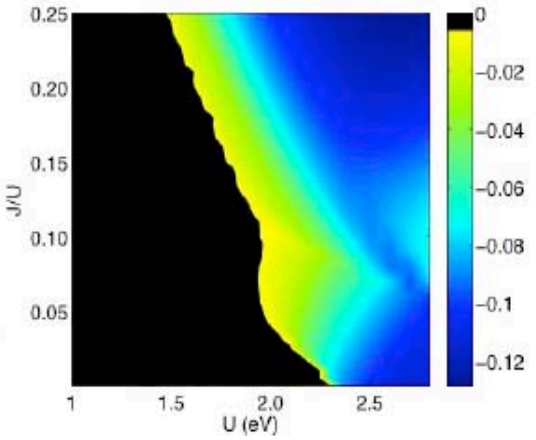
Magnetic Phase Diagram

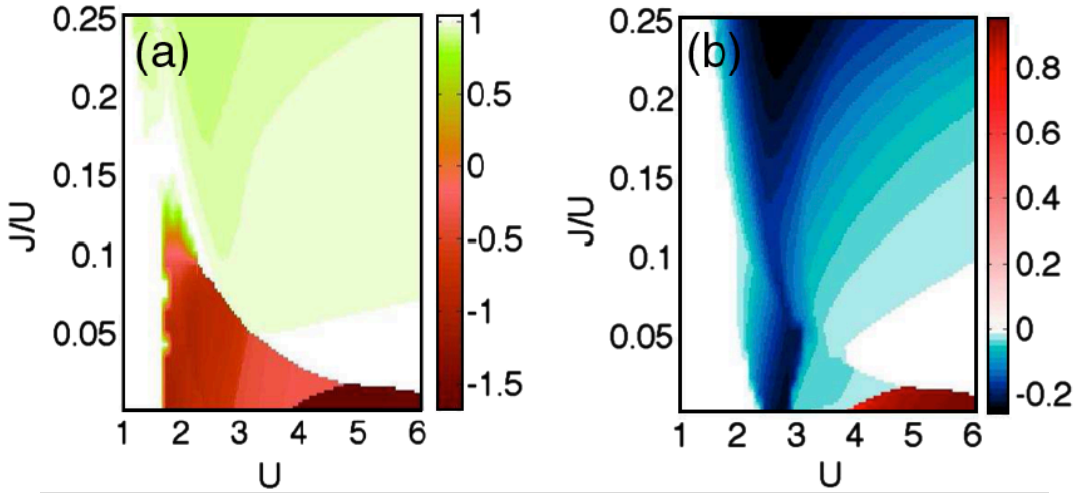


Drude Ratio (a/b)



Orbital Ordering





Orbital Ordering concomitant with Magnetism

Bascones et al., Phys. Rev. Lett. **104**, 227201 (2010) and **105**, 207202 (2010)