Raman scattering in detwinned BaFe$_2$As$_2$

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Introduction

- Interplay of magnetic and structural order
- Vicinity of magnetic order and superconductivity

Open questions:
- Origin of the magnetic order?
- Driving force of the phase transition?

BaFe$_2$As$_2$

Raman spectroscopy

Anisotropy and detwinning

- Uniaxial pressure can detwin the BaFe$_2$As$_2$ crystals, facilitating access to anisotropic features

(a) Below the phase transition the $A_g$ phonon appears in the tetragonal B$_{2g}$ phonon

(b) In detwinned crystals the phonon intensity shows a significant anisotropy between the afm and fm direction.

(c) The phonon intensity increases for shorter excitation wavelengths, showing a resonant behavior.

Conclusion

- Uniaxial pressure can detwin the BaFe$_2$As$_2$ crystals, facilitating access to anisotropic features

The $A_g$ phonon shows a resonance at approximately 3.1 eV for polarizations along the afm and fm direction.

The widths of this resonance differ significantly for the afm and fm direction, indicating a strong influence of the band reconstruction along the afm ordered axis.

The $E_g$ phonon at 125 cm$^{-1}$ splits into a B$_{2g}$ (afm) and B$_{1g}$ (fm) mode at the magnetic phase transition.