

Neutron scattering probes of phase separation and interface magnetism in magnetic oxides and metallic heterostructures

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Outline

1. Problem I:

Magnetic phase separation in perovskites
(*Small-Angle Neutron Scattering (SANS)*)

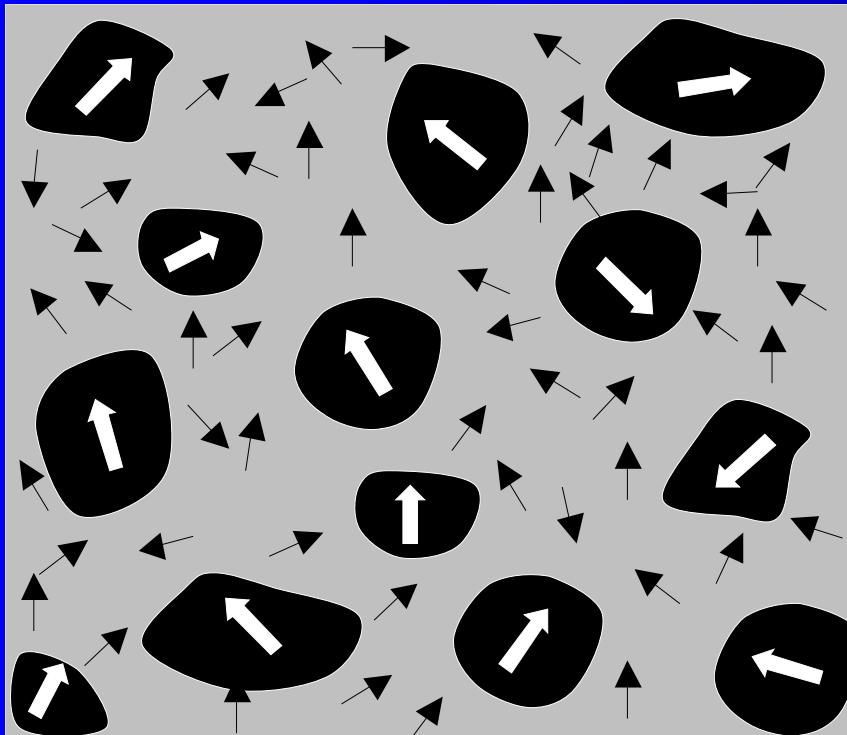
2. Problem II:

Exchange bias in metallic heterostructures
(*Polarized Neutron Reflectometry (PNR)*)

3. Wish list

Problem I: Magnetic phase separation

- CMR, High T_C , Multiferroics
- Heterogeneous magnetism, homogeneous chemistry

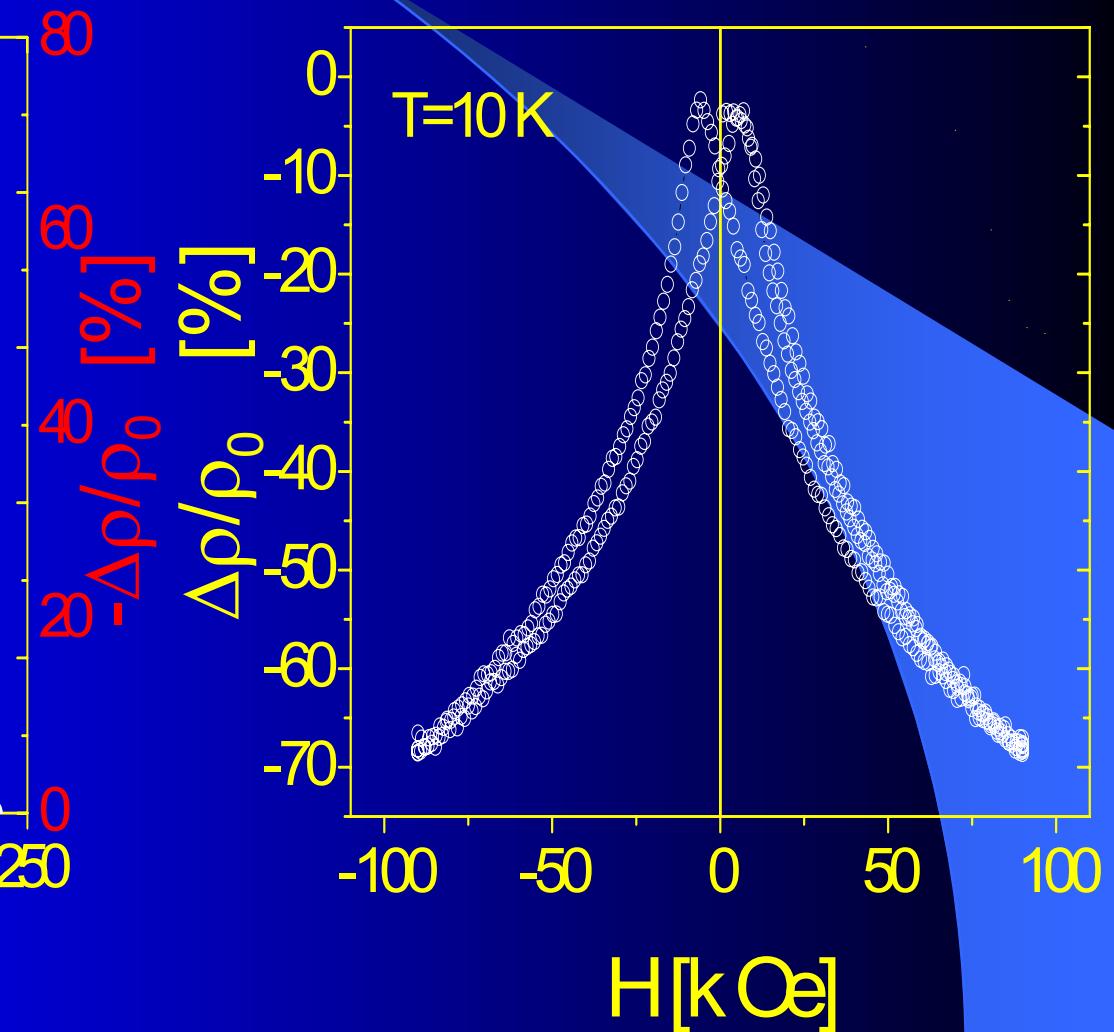
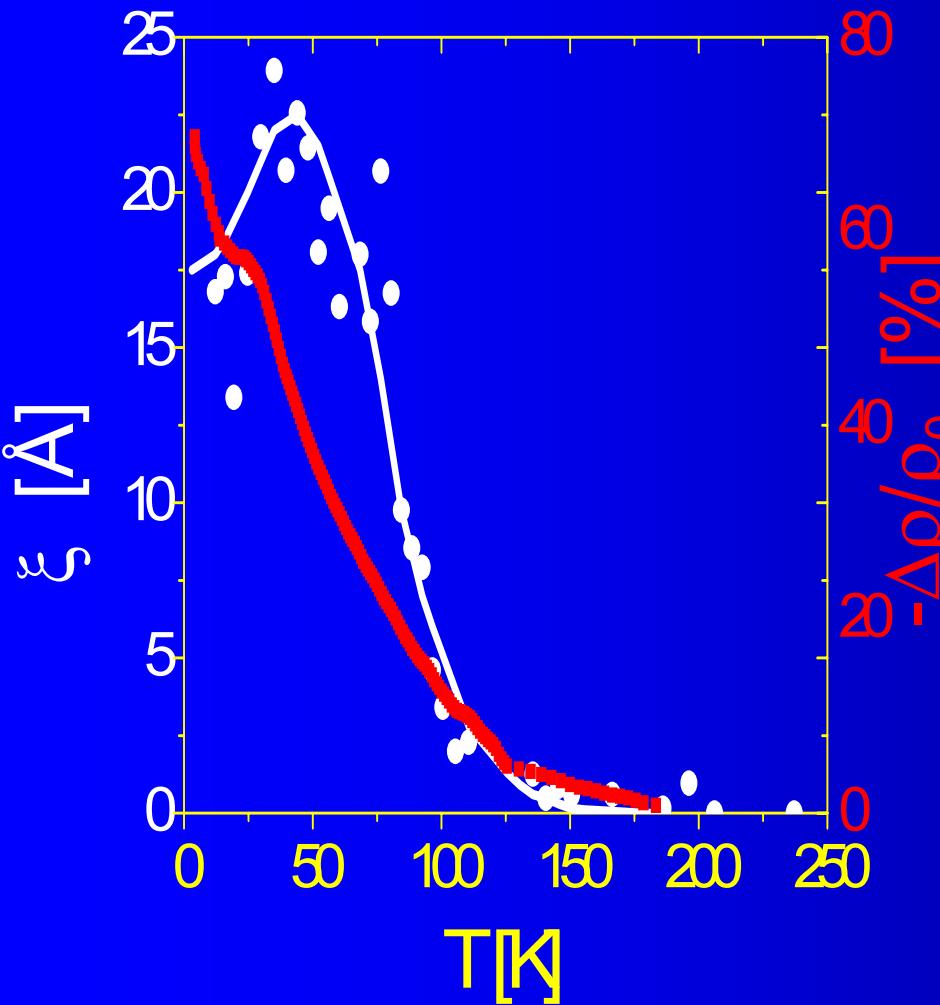


Question:

Can this spontaneous heterogeneity be controlled and used?

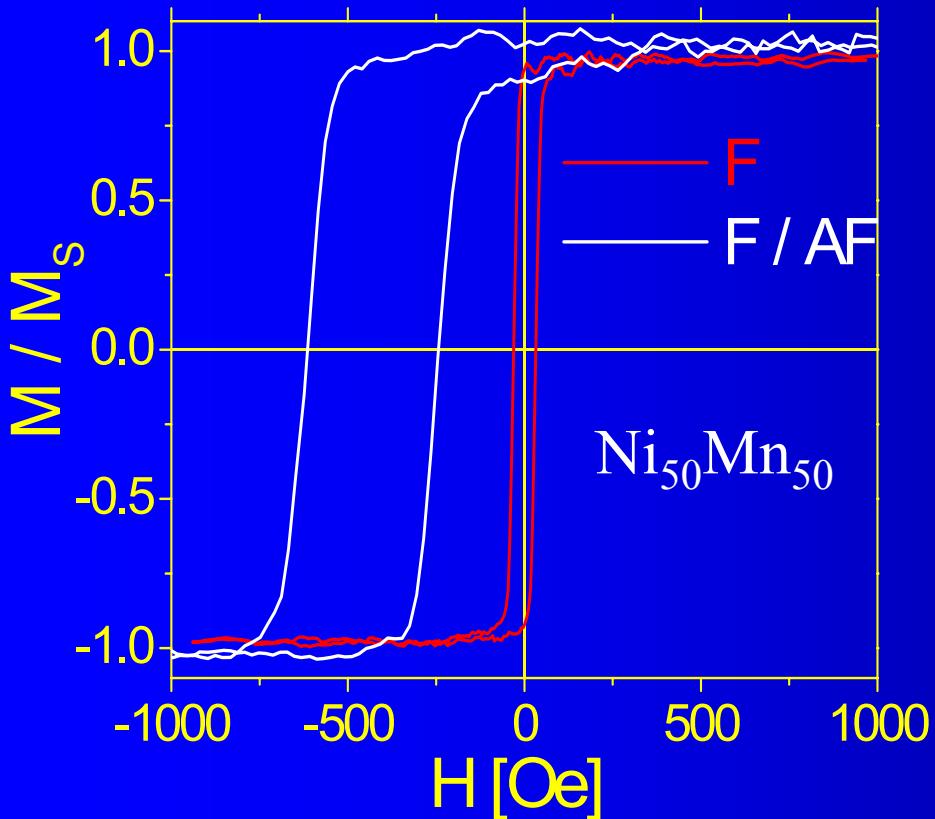
“GMR” with no chemical interfaces.....

- $\text{La}_{1-x}\text{Sr}_x\text{CoO}_3$, $x = 0.15$, SANS

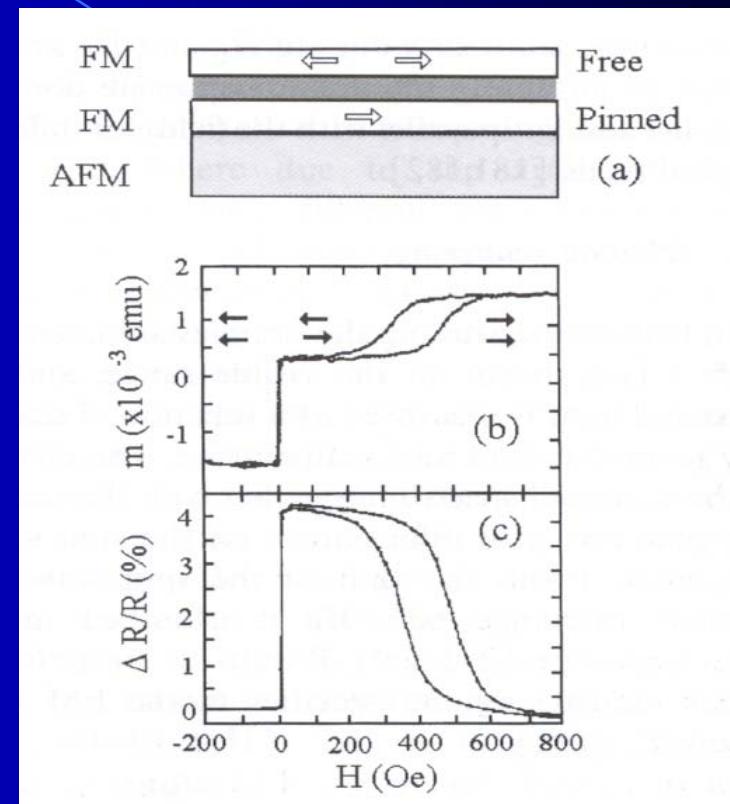


Problem II: Exchange bias

Fundamental Interest

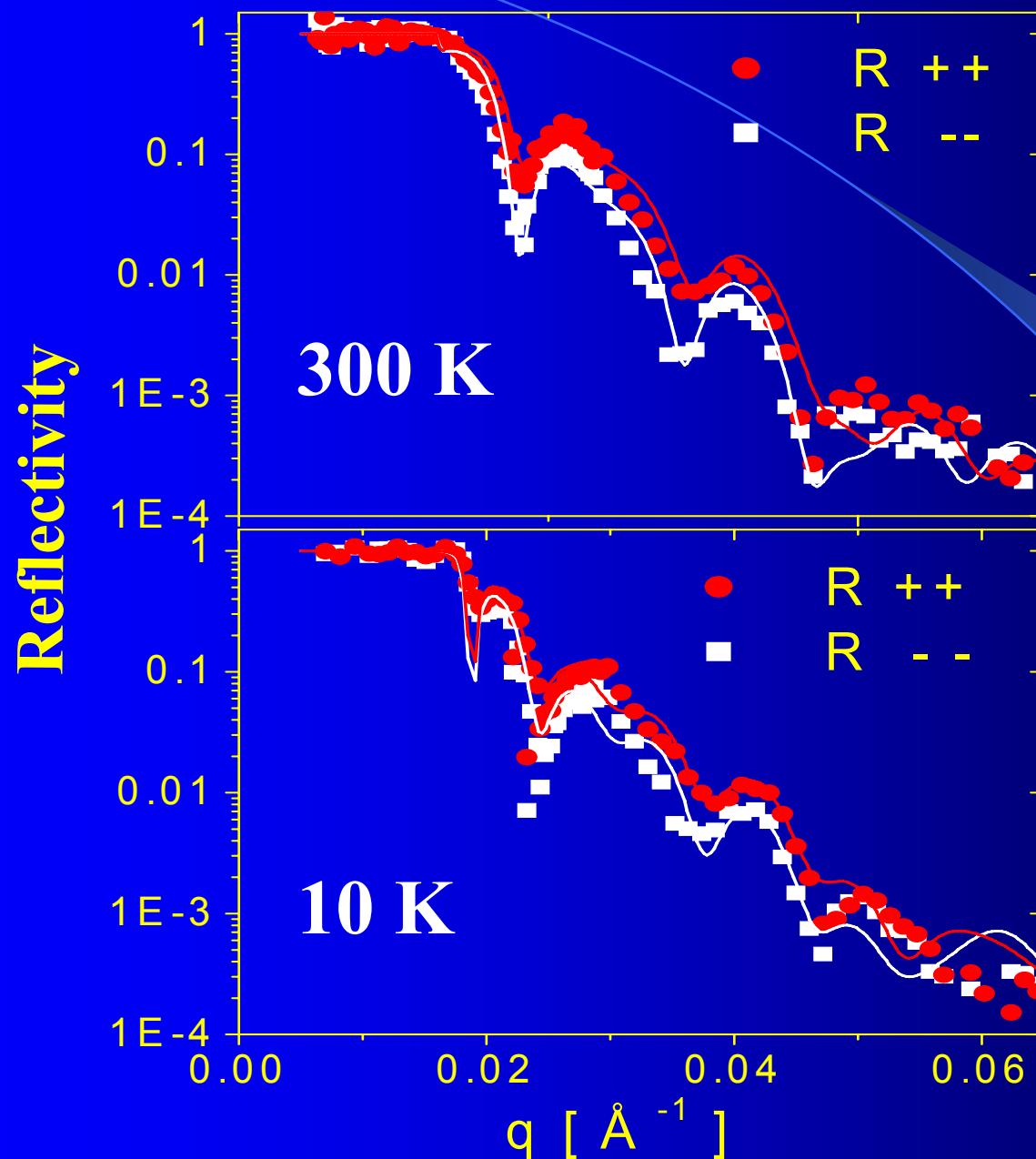


Technological Applications

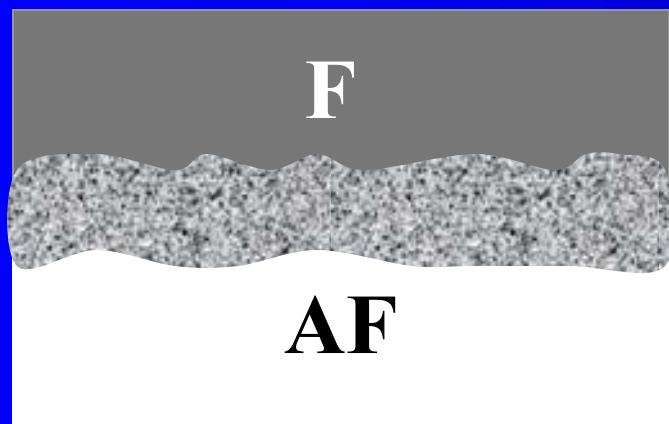


One difficulty: Interdiffusion

Temperature dependent *magnetic* interface location



Temperature dependent *magnetic* interface location



300 K

||| →
Cooling



10 K

Wish list

For exchange bias type problems:

Diffraction:

AF order parameter
~ 300 Å films?

Inelastic:

Spin waves in FMs
Superlattices, single films?
Large area nanostructure arrays?

Environment:

In-situ MOKE?

For phase separation type problems:

X-rays, microscopy, nm vs. μm length scales.