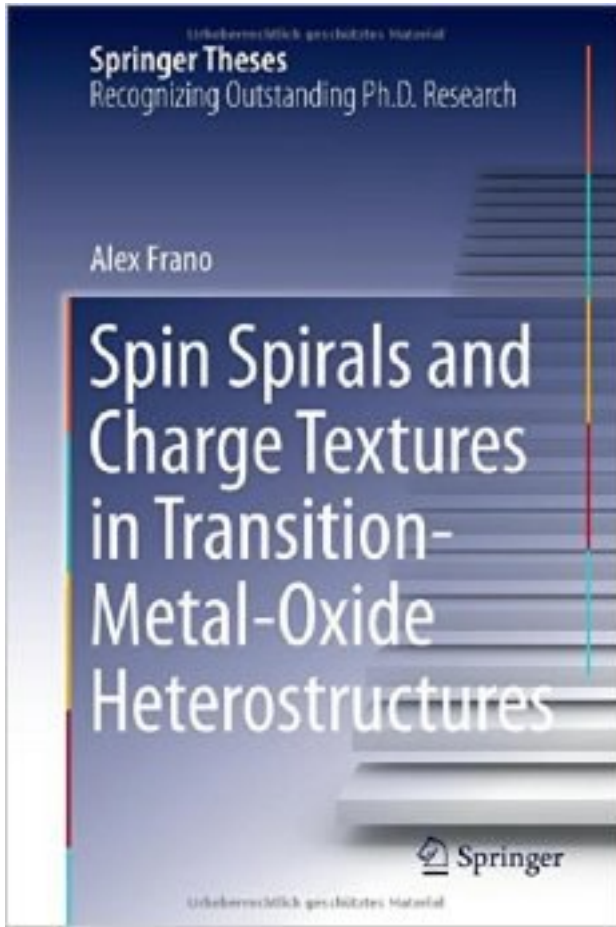


Spin Spirals and Charge Textures in Transition-Metal-Oxide Heterostructures



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出版者:Springer

出版时间:2014-6-1

装帧:Hardcover

isbn:9783319070698

Nominated as an outstanding Ph.D. thesis by the Max Planck Institute for Solid-State

Research, Stuttgart, Germany

Provides a clear summary of the properties of nickelates and cuprates, particularly useful for readers new to the field of transition-metal-oxides

Includes a detailed outline of experimental and theoretical principles of x-ray diffraction

Descriptive pictorials facilitate an intuitive understanding of the results

This thesis presents the results of resonant and non-resonant x-ray scattering experiments demonstrating the control of collective ordering phenomena in epitaxial nickel-oxide and copper-oxide based superlattices. Three outstanding results are reported: (1) LaNiO_3 - LaAlO_3 superlattices with fewer than three consecutive NiO_2 layers exhibit a novel spiral spin density wave, whereas superlattices with thicker nickel-oxide layer stacks remain paramagnetic. The magnetic transition is thus determined by the dimensionality of the electron system. The polarization plane of the spin density wave can be tuned by epitaxial strain and spatial confinement of the conduction electrons. (2) Further experiments on the same system revealed an unusual structural phase transition controlled by the overall thickness of the superlattices. The transition between uniform and twin-domain states is confined to the nickelate layers and leaves the aluminate layers unaffected. (3) Superlattices based on the high-temperature superconductor $\text{YBa}_2\text{Cu}_3\text{O}_7$ exhibit an incommensurate charge density wave order that is stabilized by heterointerfaces. These results suggest that interfaces can serve as a powerful tool to manipulate the interplay between spin order, charge order, and superconductivity in cuprates and other transition metal oxides.

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