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Role of interstitials oxygen ordering on the electronic correlation in hole-doped Pr2-xSrxNiO4+

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Stripe ordered La2-xSrxM(M=Cu,Co,Ni)O4+ oxides have been investigated intensively, as one of its family member La2CuO4+, showing the similar electronic ordering, gets superconducting at low temperature. A very special excitation of the ordered/disordered spin-stripes, shaped like an 'hour-glass', is discussed to be an important signature for the appearance of superconductivity. So far to best of our knowledge, the modulation of the stripe order has been considered solely to be modified by the Sr-doping. Not much attention has been put towards the inevitable presence of excess interstitial oxygen in these as-grown compounds at the low doping level of Sr. These interstitial oxygen are not only changing the hole concentration (hence stripe modulation of charge and spin) of these compounds, which leads to electronic phase segregation at low temperature, but also the interstitial oxygen itself gets ordered in long-range in the parent lattice. We have chosen Pr2-xSrxNiO4+ as a model system as it holds a wide range of interstitial oxygen inside the lattice. From several synchrotron and neutron diffraction measurements on different compositions of Pr2-xSrxNiO4+, we have derived models for charge dis-commensuration, to determine the possible ordering of spin stripes which could give very important information on spin microstructure for spin-wave calculation. Most importantly, in the presence of interstitial oxygen, we have evidenced that the stripe modulation is always scaled with the interstitial oxygen ordering.

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