Title:	Understanding thermomagnetic hysteresis in La1-x-yPryCaxMnO3 thin films
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Abstract:	The present work reports the scaling behaviour of thermomagnetic hysteresis in temperature and magnetic field dependent resistivity [(ρ–T) and (ρ–H)] measured during cooling/warming and H increasing/decreasing cycles in single crystalline La0.21Pr0.42Ca0.37MnO3 thin films. The zero-magnetic field (H = 0) insulator–metal transition temperature (IMT) measured in warming cycle T_{IM}^{W} ~ 166 K is higher than that in the cooling cycle $T_{_{\text{IM}}}^{\text{C}}$ = 128 K and the difference between them shrinks as H is increased. The two IMTs scale with H as ${{T}_{\text{IM}}=T_{\text{IM}}^{0}+\beta {{H}^{\alpha}}$. Here T_{IM}^{0} is the H-independent contribution, and the constants, pre-factor $\beta $ and exponent $\alpha $ determine the magnetic field dependent part. The ρ–T loop area (AT) diminishes with the increasing H as the magnetic liquid is extremely unstable with respect to external H (H < 30 kOe) and consequently AT shows an exponential decay given by ${{A}_{T}}={{A}_{T}}_{0}{{\text{e}}^{- \Gamma H}}$. Here, ${{A}_{T}}_{0}$ is the zero-field normalized area and Γ is a constant related to the degree of phase separation. The analysis of the isothermal ρ–H loop area, which increases with H shows scaling behaviour of the type $A(H)={{A}_{H}}{{\left(H-{{H}_{\text{IM}}}\right)}^{\eta}}$. Here, the constant HIM corresponds to the magnetic field that induces AFMI to FMM phase transition and decreases with temperature, while the exponent 'η' measures the degree of phase separation. The value of η is found to be temperature dependent and hence related to the relative fraction of the two coexisting phases.
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