Mesoscopic transport in ultrathin films of La$_{0.67}$Ca$_{0.33}$MnO$_3$ C.
BEEKMAN, J. ZAANEN, J. AARTS, University of Leiden — We investigate the
electrical transport in mesoscopic structures of La$_{0.67}$Ca$_{0.33}$MnO$_3$ in the regime of
the metal-insulator transition by fabricating microbridges from strained and un-
strained thin films. We measure current-voltage characteristics as function of tem-
perature and in high magnetic fields and with varying film thickness. For strained
films, in warming from the metallic to the insulating state, we find non-linear effects
in the steep part of the transition characterized by a differential resistance with a
strong peak around zero applied current, and saturating at higher currents after
resistance drops up to 60 %. We propose that this nonlinear behavior is associated
with melting of the insulating state by injecting charge carriers, signalling the occur-
rence of an intervening phase which involves the formation of short range polaron
correlations.

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