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On the Microstructure of the Charge Density Wave Observed in La1-xCaxMnO3 JAMES LOUDON, Cambridge University, SUSAN COX, NEIL MATHUR, PAUL MIDGLEY — We have used low temperature (90 K) transmission electron microscopy to investigate the 'charge ordering' modulation in the mixed valent manganite, $La_{1x}Ca_xMnO_3$. It has been stated that Mn^{3+} and Mn^{4+} ions order at low temperature to produce a structural modulation composed of supercells whose size is an integer multiple of the unmodulated unit cell. Here, we use convergent beam electron diffraction to show that the periodicity of the modulation need not be an integer multiple of the undistorted cell, even on the smallest scales. We therefore suggest that this modulation is a charge density wave with a uniform periodicity. We show that the modulation wavevector lies close to the **a*** axis of the crystal but need not be exactly collinear. A typical grain of size 0.5 μm in $La_{0.48}Ca_{0.52}MnO_3$ had a wavevector which varied on a scale of tens of nanometres with an average of $<\mathbf{q}> = 0.450\mathbf{a}*$ and a standard deviation $\Delta q = 0.004a*$ in its magnitude and $\Delta\theta = 0.56^\circ$ in its direction at 90 K. The magnitude of the wavevector in this composition fell by 20% as the temperature was increased from 90 K to room temperature. This change occurred by nucleation and growth. Although weak, the modulation was still present at room temperature, some 30 K above the 'charge ordering temperature'.

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