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# Effect of cation size and disorder on the properties of the rare earth cobaltates, $Ln_{0·5}A_{0·5}CoO_3$ (Ln = rare earth, A = alkaline earth)

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The ferromagnetic Curie temperature $T_C$, of the rare earth cobaltates, $Ln_{0·5}A_{0·5}CoO_3$ increases with the average size of the A-site cation up to an $\langle r_A \rangle$ of 1·40 Å and decreases thereafter due to size mismatch. Disorder due to size mismatch has been investigated by studying the properties of two series of cobaltates with fixed $\langle r_A \rangle$ and differing size variance, $s^2$. It is found that $T_C$ decreases linearly with $s^2$, according to the relation, $T_C = T^0_C - p\,s^2$. When $s^2$ is large (> 0·012 Å$^2$), the material becomes insulating, providing evidence for a metal–insulator transition caused by size-disorder. Thus, $Gd_{0·5}Ba_{0·5}CoO_3$ with a large $s^2$ is a charge-ordered insulator below 340 K. The study demonstrates that both average radius, $\langle r_A \rangle$, and size-disorder play a role in determining the magnetic and transport properties of the rare earth cobaltates.