

**EFFECT OF Cr SUBSTITUTION AT Mn SITES ON MAGNETIC
AND TRANSPORT PROPERTIES IN CHARGE ORDERED
 $\text{Nd}_{0.5}\text{Ca}_{0.5}\text{Mn}_{1-x}\text{Cr}_x\text{O}_3$ ($x = 0, 0.02, 0.05$) MANGANITES**

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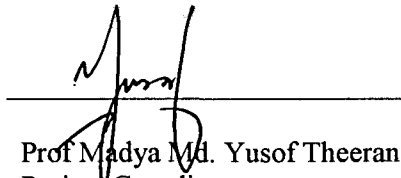
**Final Year Project Submitted in
Partial Fulfilment of the Requirements for the
Degree of Bachelor of Science (Hons.) Physics
in the Faculty of Applied Sciences
Universiti Teknologi MARA**

JANUARY 2013

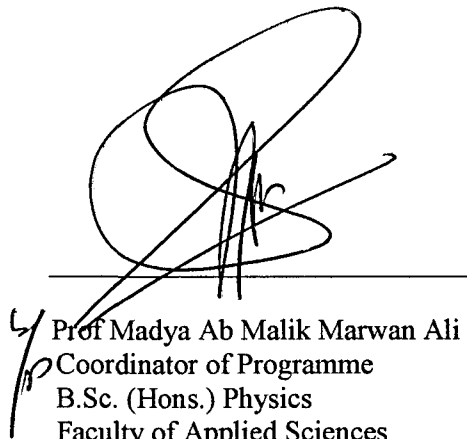
This Final Year Project Report entitled "Effect of Cr substitution at Mn sites on magnetic and transport properties in charge ordered $\text{Nd}_{0.5}\text{Ca}_{0.5}\text{Mn}_{1-x}\text{Cr}_x\text{O}_3$ ($x = 0, 0.02, 0.05$) manganites" was submitted by Zainab Binti Mohamad Asri, in partial fulfillment of the requirements for the Degree of Bachelor of Science (Hons.) Physics, in the Faculty of Applied Sciences, and was approved by



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Date: 29 JAN 2013

ACKNOWLEDGEMENTS

Firstly, I would like to express my deepest gratitude to Allah S.W.T for His blessing and guidance that I have a chance to write final year proposal in this semester.

Secondly, I would like to express my greatest gratitude to my respected supervisor and postgraduate mentor; Prof Dr Ahmad Kamal Hayati Yahya and Suhadir Shamsuddin who had been guiding me through all the troubles in finishing this final year project. I'm really thankful to have he as my supervisor and as my postgraduate mentor as they motivated me a lot and also provided me with the information and ideas that I'm supposed to know in this project in order to gain better reviews and results.

Last but not least, I would like to thank my family and all my friends for being very supportive and helpful in giving me great oral supports to finish this final year project. Alhamdulillah and May Allah bless us all.

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ABSTRACT

Charge ordered $\text{Nd}_{0.5}\text{Ca}_{0.5}\text{Mn}_{1-x}\text{Cr}_x\text{O}_3$ ($x = 0, 0.02, 0.05$) have been investigated using electrical resistivity and magnetic susceptibility to explain the effect of Cr substitution on electrical transport and magnetic properties. Electrical resistivity and magnetic susceptibility measurements showed that the $x = 0$ sample exhibits an insulating behavior and an anti-ferromagnetic (AFM) transition at 230K which can be related due to $\text{Mn}^{3+} - \text{O}^{2-} - \text{Mn}^{4+}$ interaction. With increasing of Cr content, a metal-insulator (MI) was observed and the transition shifted to higher temperature from $T_{MI} \sim 133\text{K}$ ($x = 0.02$) to $T_{MI} \sim 136\text{K}$ ($x = 0.05$) accompany with the ferromagnetic (FM) transition which is observed around $T_C \sim 148\text{K}$ and $T_C \sim 152\text{K}$ for $x = 0.02$ and $x=0.05$ respectively. This can be suggested to be due to the double exchange (DE) mechanism of $\text{Mn}^{3+} - \text{O}^{2-} - \text{Mn}^{4+}$. Apart from that, the magnetic susceptibility and resistivity measurement indicated the existence of charge ordering (CO) state at a sharp peak. With increasing Cr substitution, the CO states weakened due to weakening of Jahn Teller (JT) effect.