

*Structural analysis of nanocrystalline spinel synthesized by quasicrystalline precursor*Harshit Agarwal¹, T. P. Yadav¹, O. N. Srivastava¹, M. A. Shaz¹¹Department Of Physics, Institute Of Science, Banaras Hindu University, Varanasi, Varanasi, India

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The cations $\text{Co}^{2+}/\text{Ni}^{2+}$ and Al^{3+} distribution in nanocrystalline $(\text{Co,Ni})\text{Al}_2\text{O}_4$ spinel have been investigated using X-ray and transmission electron microscopy. The novel nanocrystalline $(\text{Co,Ni})\text{Al}_2\text{O}_4$ spinel has been synthesized by mechanically milling of $\text{Al}_7\text{OCo}_{15}\text{Ni}_{15}$ decagonal quasicrystalline precursor with further annealing at 873 K under a controlled oxygen atmosphere for 20 hours. The x-ray diffraction data has been refined by the Rietveld method using JANA2006 and subsequently, the corresponding structure has been constructed using software Diamond 4.1. The phase structure has also been confirmed by analysis of transmission electron microscopy. Selected area diffraction (SAED) pattern obtained by TEM has been linearized by diffraction ring profiler software, which is analogous to XRD pattern of $(\text{Co,Ni})\text{Al}_2\text{O}_4$ confirms the d- values and corresponding plane. This is new software where data extracted from SAED is used for probable refinement. These analyses indicate that the cations Co^{2+} and Ni^{2+} distributed in the tetrahedral coordinated sites are the dominant species in the normal spinel phase.

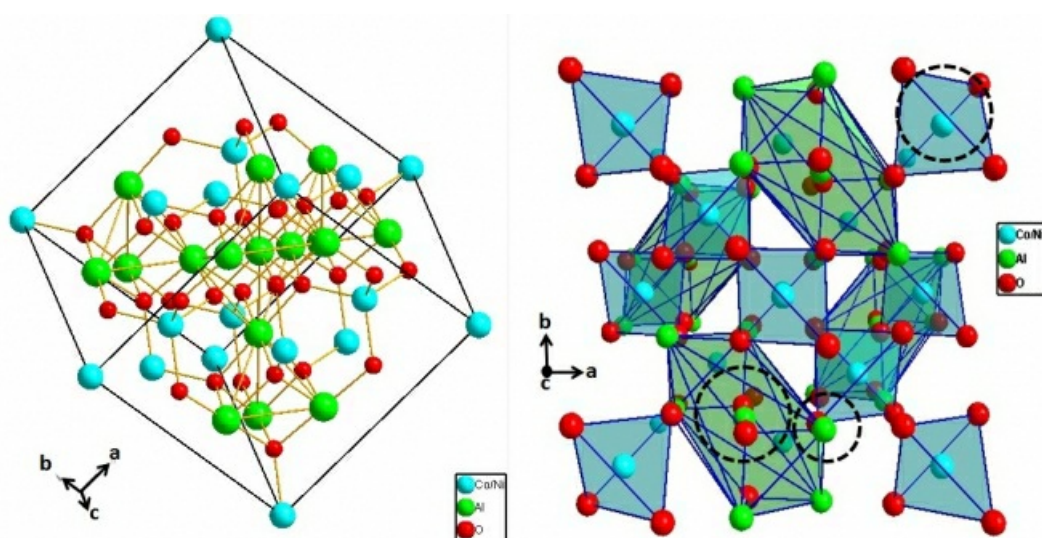
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Fig- (a) Structure of $(\text{Co,Ni})\text{Al}_2\text{O}_4$ and (b) Polyhedron view of Spinel $(\text{Co,Ni})\text{Al}_2\text{O}_4$ where Co/Ni occupies Tetrahedral site and Al occupies Octahedral Site

Keywords: [Spinel](#), [X-ray methods](#), [Electron Microscopy](#)