

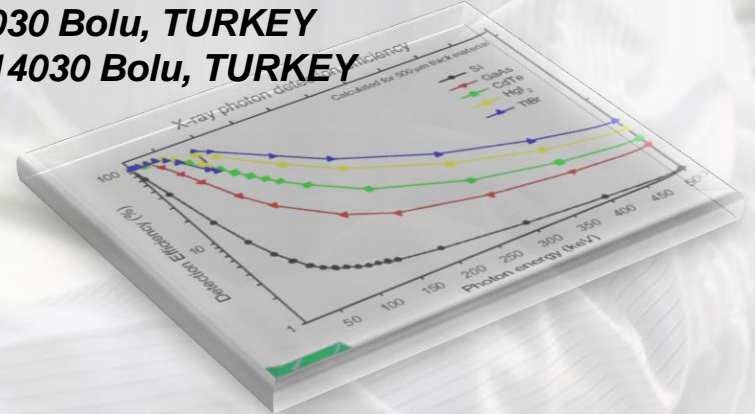
Structural Properties And Radiation Response Of Neodymium Oxide

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Experimental Details

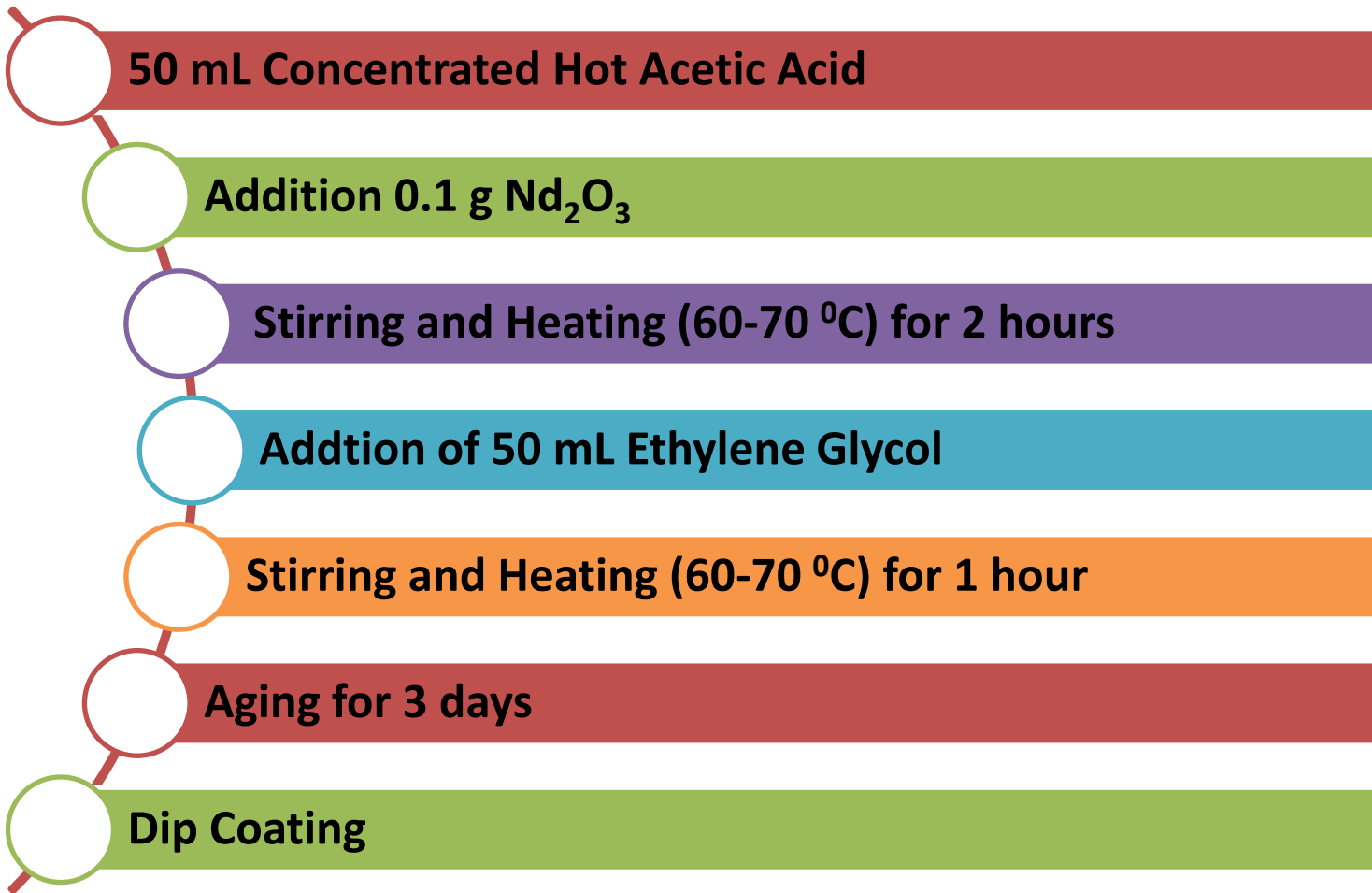


Fig 1. The process flow for fabrication of Nd_2O_3 films by sol–gel dip coating method

Structural Analysis Results

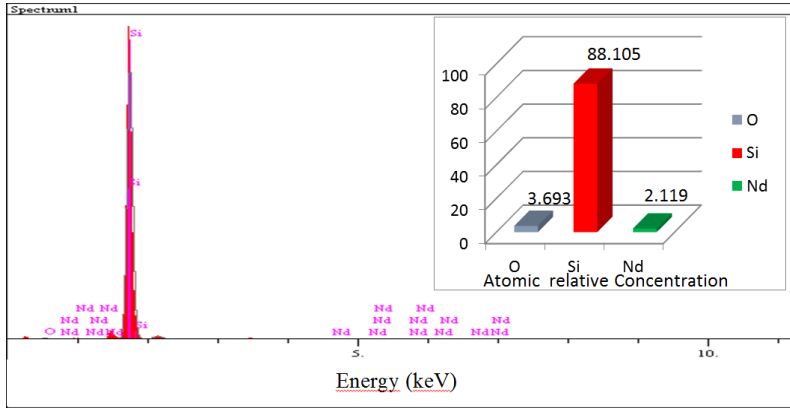


Fig.2 Energy Dispersive Spectra of Nd₂O₃

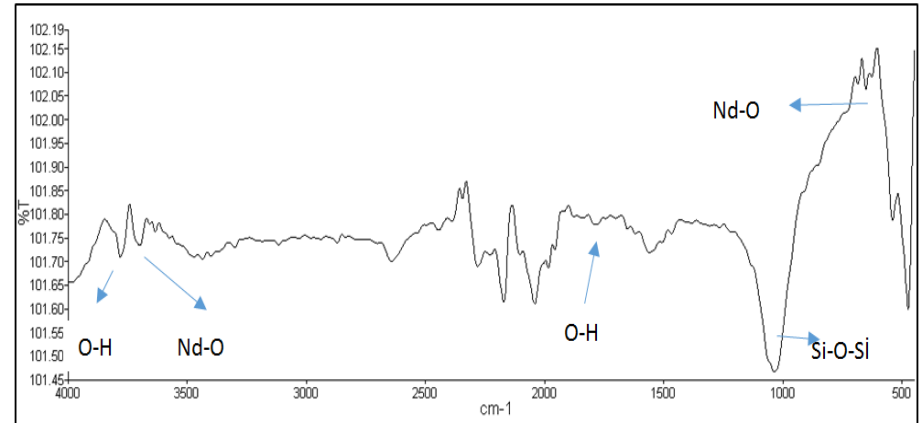


Fig.3. Fourier transform infrared spectroscopy (FTIR) of Nd₂O₃ thin films

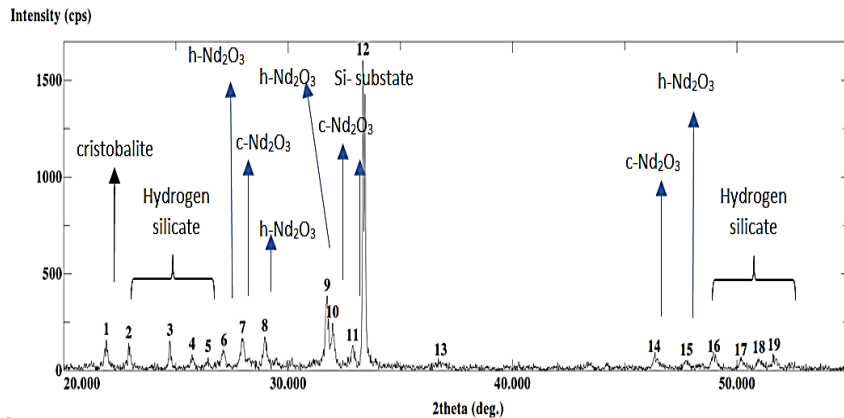


Fig. 4. XRD patterns of Nd₂O₃ thin films on Si-P(100) deposited by sol-gel dip coating technique.

The basic combinations of the elements in Nd₂O₃ were investigated by EDS and the results were given in Fig. 2. Silicon, oxygen, and neodymium were found in the structure. The neodymium concentration was approx. 59.41% and the oxygen concentration corresponding to the neodymium in the structure was calculated as approx. 10.21%. The amount of excess oxygen, 9.45%, was originated from cristobalite formation. XRD, FTIR and EDS results indicated that Nd₂O₃ was produced. Figure 3 indicated the FTIR spectrum of Nd₂O₃ on Si after annealing at 650 °C. A small shoulder peak at around 3608 cm⁻¹ and the sharp peak at around 653 cm⁻¹ was labeled as Nd-O vibrations [17–20] and a strong peak at around 3344 and 1639 cm⁻¹ were assigned to stretching vibration of O-H (water) [19, 20]

Figure 4 indicated the XRD pattern of Nd₂O₃ on silicon wafer annealed at 650 °C in air for two hours. Low crystalline cubic (c) phase of Nd₂O₃ were observed in the diffractogram.

Structural Analysis Results

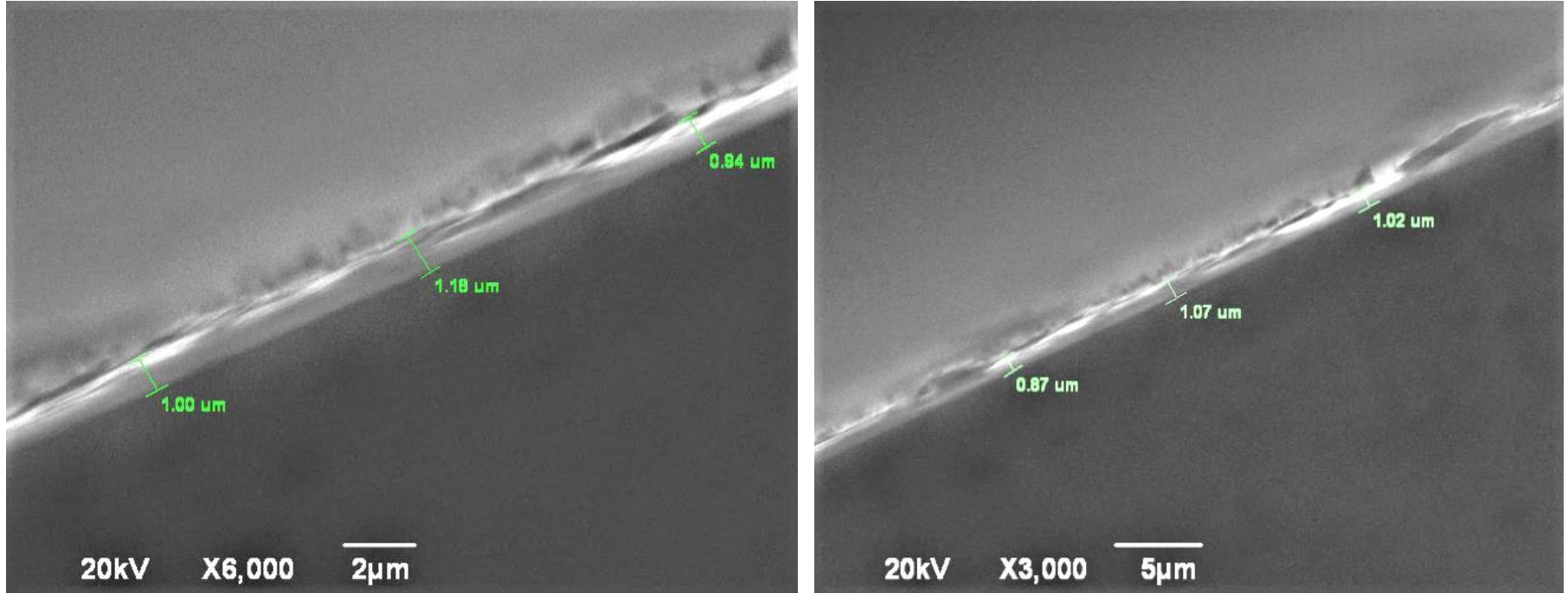


Fig. 5. Cross section morphology of the Nd_2O_3 thin films on deposited Si-p (100)

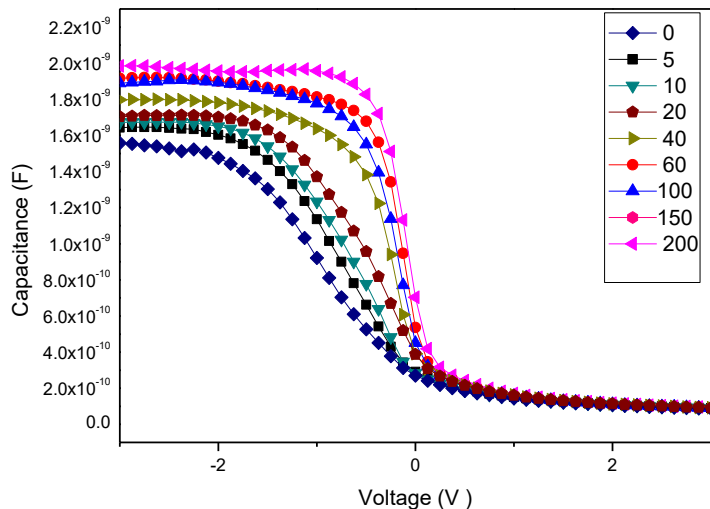


Fig.6 .The capacitance – voltage (C-V) curves of Nd₂O₃-i-P(100) MOS capacitor for the different radiation doses

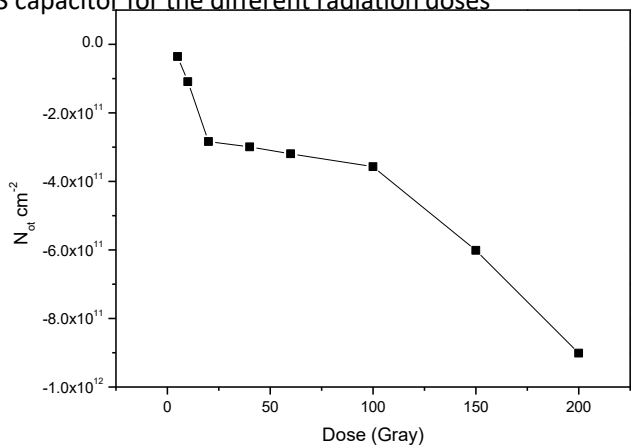


Figure 8. Variation of the oxide traps the Nd2O3 p-MOS Capacitor depending on total gamma dose.

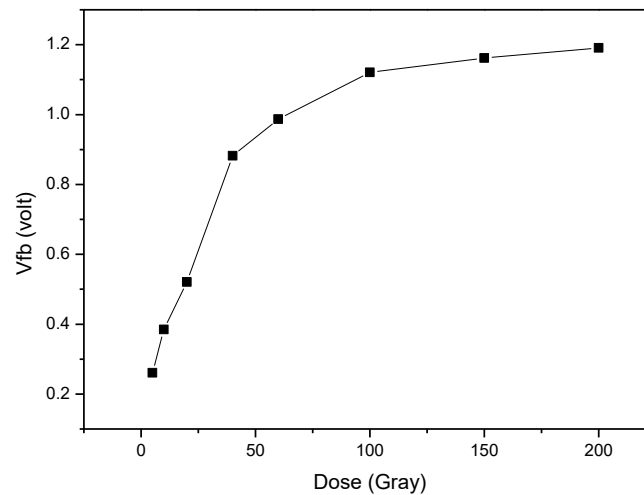


Fig.7 Variation of the flat band voltages of the Nd2O3 p-MOS Capacitor depending on total gamma dose.

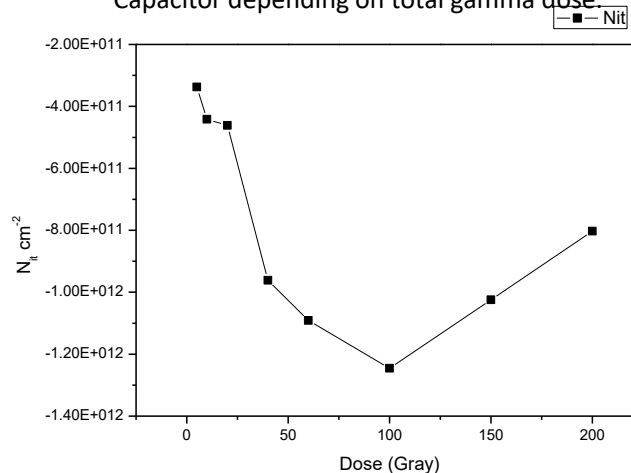


Figure 9. Variation of the interface state the Nd2O3 p-MOS Capacitor depending on total gamma dose

Conclusion

- According to the results of structural analysis, neodymium oxide structure has been successfully produced.
- The capacitance-voltage measurement results illustrated that the irradiated MOS capacitors shifted to the left side systematically.
- It is concluded that Neodmiyum oxide is suitable for electronics applications in radiation measurement.

Acknowledgements:

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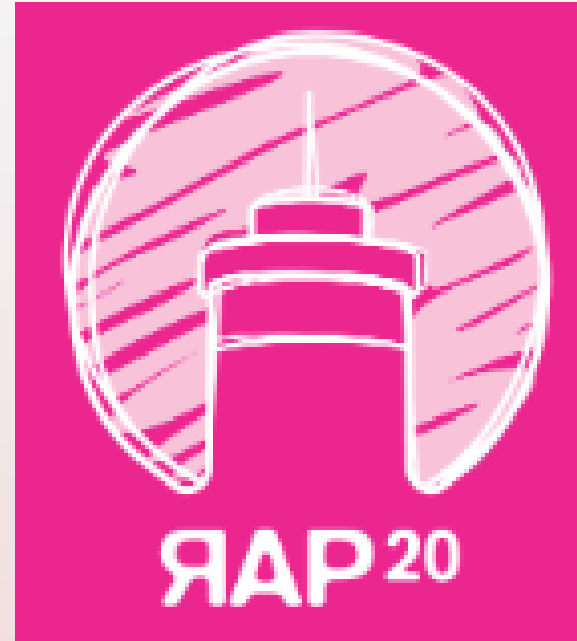
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