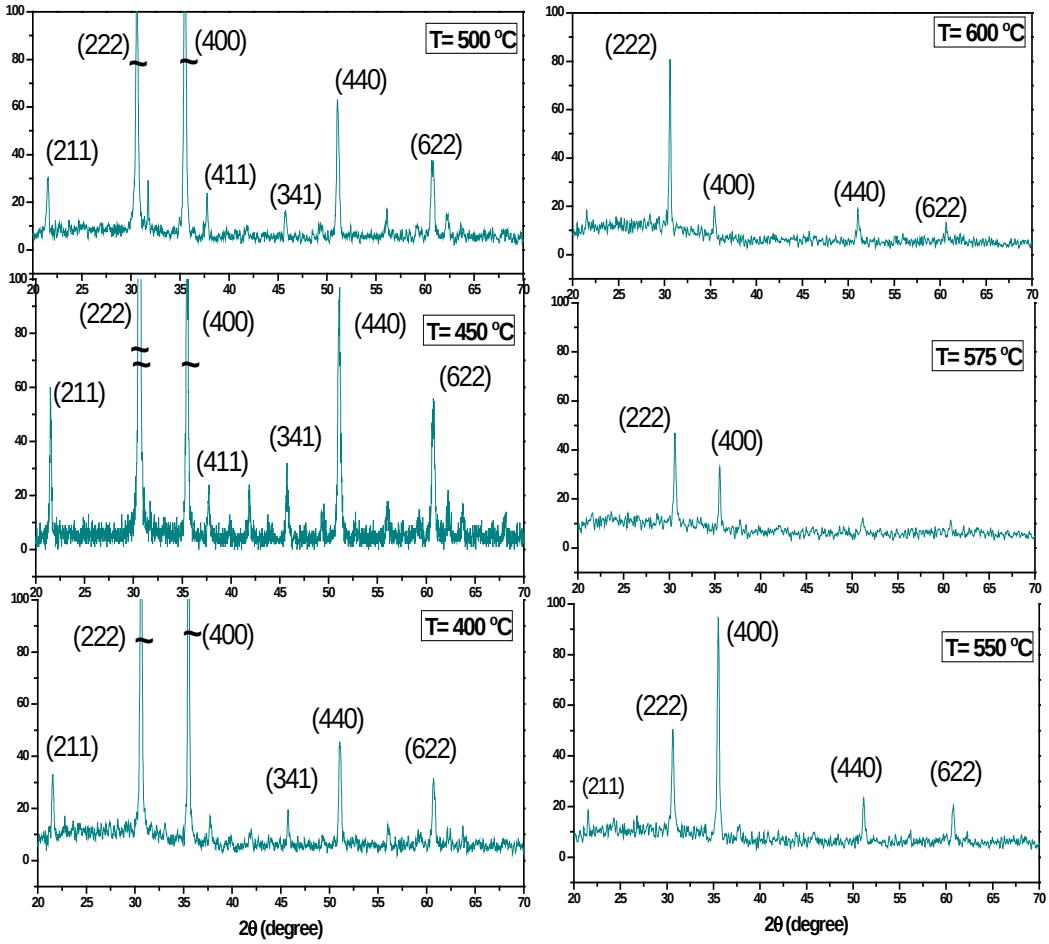

Fig. 2: XRD patterns of IFO films prepared at various substrate temperatures

The SEM results show that the size of crystals is in the range on nanometer. The size of particles changing with respect to deposition parameters. Fig. 3 shows that, the crystalline improved with increasing substrate temperature. Furthermore, the density of grain boundaries and dislocation therefore decreases, leading to the improvement of conductivity and transparency of IFO films.

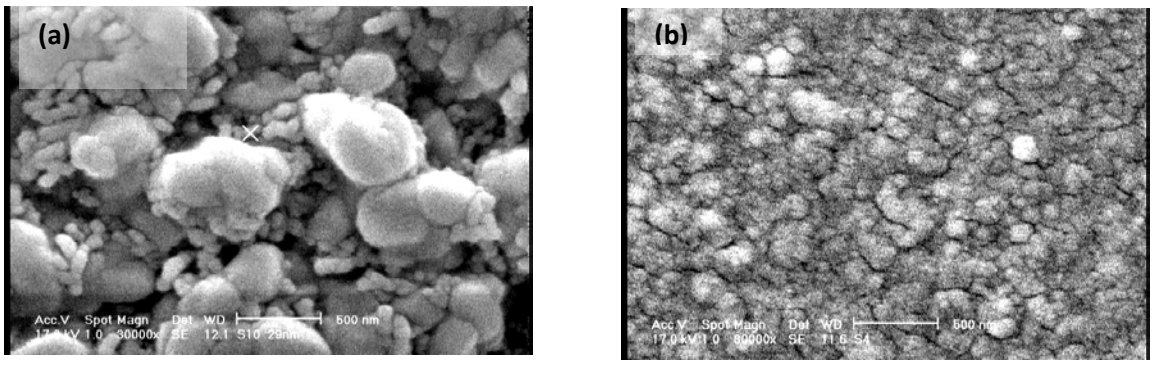

Fig.3 SEM images of IFO films prepared at different substrate temperature: a) 450 °C and b) 575 °C.

Subsequently the amount of indium powder also was investigated for the prepared films. Result show that the resistivity is decreased by increasing of indium powder but transparency is decreased. Besides, the thickness of the films is determined by PUMA software [10].

4. Conclusions

In this research, fluorine doped indium oxide (IFO) nanostructure were prepared at different F concentration, substrate temperature and $InCl_3$ concentration using spray pyrolysis technique. Then effects of above parameters on structural, electrical and optical properties of nanostructure thin films of IFO were investigated. The SEM results show that the size of crystals is in the range on nanometer. The size of particles changing with respect to deposition parameters. The presence and intensity of XRD peaks decreased with increasing substrate temperature; as a result crystallinity improves leading to well-transmission and resistivity.In conclusion, the optimum IFO films were prepared using 0.2 gr $InCl_3$ with F concentration of 2wt% at substrate temperature of 575 ° C. With this condition sheet resistance was 140 Ω/□ and the optical transmission in visible region was 87.6%.

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