1-Aims & Objectives
● To modify the optical and electrical properties of Nickel Nanowires (Ni-NWs) meshes by carbon ions irradiation.

2-Background
● Strongly conductive networks of metal nanowires (MNWs) are imperative for the stream of charge carriers in many new technologies today [1].
● Damage to nano-structured materials on exposure to energetic ions has been a general misconception but recent research has proved it to be a tool for tailoring electronic [2,3], optical [4], and magnetic [5] properties and changing the structure [6] of nanomaterials in a simple manner.
● In this work, we employed ion beam irradiation technology as a tool to modify the properties of Ni-NWs.

3-Experimental Section
● The average diameter of Ni-NWs was about approx. 300-500nm. The average length of pristine Ni-NWs was 100-200 µm.
● The solution of Ni-NWs was deposited on glass substrate using drop casting method. The samples were thereafter subjected to ion beam irradiation at 5 MeV C+ ions at room temperature, which the beam fluencies ranging from 1 x10^{14} to 1x10^{17} ions/cm² using a 5UDH-Pelletron accelerator.
● The morphology and structure of both un-irradiated and irradiated Ni-NWs networks were characterized using scanning electron microscopy (SEM), transmission electron microscopy (TEM) and x-ray diffraction (XRD) techniques. Optical and electrical measurements were made using UV-VIS spectroscopy and four probe techniques. The conductivity was calculated by a four-point probe technique.

4-Results & Discussions
● The optical transparencies of Ni-NWs meshes are increasing with increase in fluence of C+ ions. Increment in optical transparency of Ni-NWs meshes may be attributed to thinning of Ni-NWs under the influence of C+ ions beam irradiation.
● To confirm the stability of structure of 5 MeV C+ ion beam irradiated Ni-NWs, XRD measurements were performed at room temperature and are shown in Figure 2.

Figure 2: XRD patterns of Ni-NWs at different ion irradiation doses.

Figure 3: Electrical conductivity (relative i.e., G/G0) of Ni-NWs meshes as a function of fluence of C+ ions.

5-Conclusions
● The present C+ ions irradiation technology was proved to be a superb approach to modify electrical conductivity and optical transparencies of nickel nanowires.

References