

# **Irradiation effect on the electrical characteristics of an AlGaAs/GaAs based solar cell: Comparison between electron and proton irradiation by numerical simulation**

**W. Laiadi, Af. Meftah, N. Sengouga \*, Am. Meftah**

Laboratory of Metallic and Semiconducting Materials (LMSM), Université de Biskra, BP 145, 07000 Biskra RP, Algeria

## **A b s t r a c t**

In this work we use numerical simulation to make a comparison between the effect of electron and proton irradiation on the current voltage (J–V) characteristics of a GaAs based solar cell. This is an extension of a previous work in which we have demonstrated that the use of a gradual gap Al<sub>x</sub>Ga<sub>1-x</sub>As window improves the resistivity of the cell to electron irradiation. In this paper we use the gradual gap Al<sub>x</sub>Ga<sub>1-x</sub> layer as window material on the top of the GaAs cell and we study the effect of its thickness on the output parameters of the cell exposed to 1 MeV electron and proton irradiation. The external cell parameters are: the short circuit current (J<sub>sc</sub>), the open circuit voltage (V<sub>oc</sub>), the fill factor (FF) and the conversion efficiency (g). Our results show that J<sub>sc</sub> is more sensitive to electron irradiation while V<sub>oc</sub> is a little bit more sensitive to proton irradiation. This gives nearly the same effect of the two types of irradiation on the conversion efficiency of the cell. We found also that the increase of the gradual Al<sub>x</sub>Ga<sub>1-x</sub>As window thickness from 0.09 to 0.3 μm improves the resistivity of the solar cell to irradiation.

## **Keywords:**

AlGaAs window

GaAs solar cell

Electrons

Protons

Irradiation

Numerical simulation