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(54) **Photovoltaic device and method of manufacturing same**

(57) Hetero-junction solar cell with front side TCO stack comprising a front-sided first transparent conductive layer (5) of a first base material with a first doping and a first non-stoichiometric composition, wherein the first base material is chosen from indium oxide, zinc oxide, tin oxide, and cadmium oxide; and a front-sided second transparent conductive layer (6, 6a, 6b) or structure of the first base material or a second base material, having the first or second doping and a second non-stoichiometric composition. The average carrier concentration of the whole front-sided transparent conductive material stack is between $1 \times 10^{20} \text{ cm}^{-3}$ and $2 \times 10^{20} \text{ cm}^{-3}$; the refractive indices (n) of the first and second layers are in the same range, wherein $n > 2$ at a wavelength of about 550 nm; and the carrier mobility in the front-sided first transparent conductive layer is higher than the carrier mobility in the front-sided second transparent conductive layer or structure if the layers/structure have a comparable thickness.

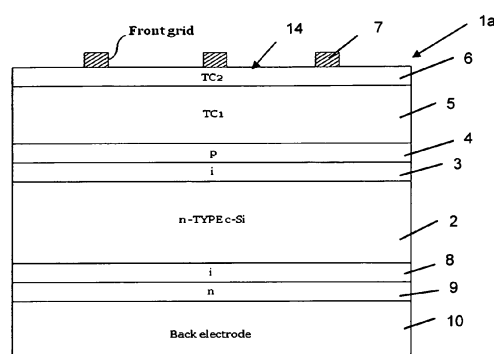


Fig. 1