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Enhancement of photovoltaic characteristics of Si nanostructure via metal-assisted etching

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In this paper, Au nanoparticles by pulsed laser ablation in liquid (PLAL) was prepared. Various affecting parameters were studied such different laser energy (100, 300, and 500 m J). In the second part, includes the optimum results of Au NPs depositing on PS (Au NPs/PS) by drop casting. We have studied the structural, morphological, optical, surface, and electrical properties includes the current density-voltage (J-V), and capacitance-voltage (C-V) characteristics. XRD spectra showed decrease broadening plane Si (111) and Au at increasing energy, this due to increases the crystallite size. AFM showed be the pores width increased with increasing etching time, and PS surface showed lower reflectance with increasing etching time, which is due to increase roughness index. The electrical properties showed decrease in current pass in PS layer with increases etching time, this due to increase resistivity PS layer. C-V measured showed decreases the capacitance at increase etching time and this due to increase built-in potential and width of depletion. From J-V measured in solar cell show the efficiency rang between (1.42-2.5%). Also AFM of Au NPs/PS showed increases the pores width with increasing energy. The electrical properties showed decrease in current pass in Au NPs/PS layer at increases etching time and energy, this due to increases resistivity Au NPs/PS layer. C-V measured showed decreases the capacitance of the solar cell layer at increase etching time and energy, this due to increase built-in potential and width of depletion. From J-V measured in solar cell show the efficiency rang between (3.5-6.0%).

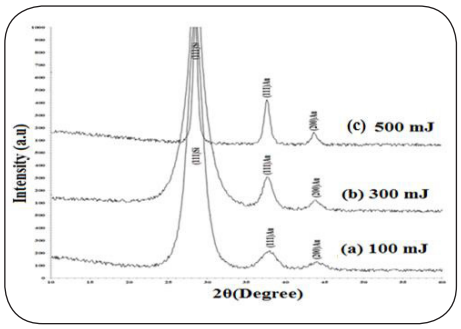

Figure 1: X-ray diffraction of Au nanoparticles deposited on porous silicon (a) 100 (b) 300 and (c) 500 m J

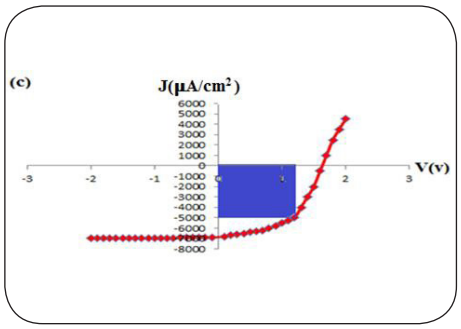

Figure 2: The current density-voltage characteristics of Al/Au NP/PS/p-Si/Al

Biography

Falah A H Mutlak received a BSc in the Department of Physics in 1998, MSc degree in Spectroscopy Physics in 2002 and PhD degree in Molecular Spectroscopy Physics in 2011, from the University of Baghdad, College of Science. Currently, he is a Lecturer in the Department of Physics and member of Renewable Energy Research Group in the Department of Physics, College of Science, Baghdad University, Iraq.

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