



STUDY OF THE INCREASE IN DUST CONTENT ON THE SURFACE OF MONOCRYSTALLINE, AMORPHOUS AND POLYCRYSTALLINE SOLAR PHOTOVOLTAIC PANELS AND ITS IMPACT ON EFFICIENCY

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Abstract: *in the article monocrystalline, amorphous and polycrystalline sun photoelectric panels to the efficiency impact indicative external factors especially dust with related problems studied. Three kind sun photoelectric panel to the surface fallen dustiness or pollution every from 3% to 14% in both was power to disappear reason will be.*

Keywords: *dust content, monocrystalline, amorphous and polycrystalline sun photoelectric panels, various dust samples, photocurrent expression equation, radiation.*

In the world energy in the system sun from energy in particular, the sun photoelectric from panels use developed is increasing. Worldwide electricity energy was need year gradually exceed that is going see possible. If the last five annual can if we are, world according to every year electricity to energy was demand increased by 50% This is an alternative It requires the expansion and development of energy sources. According to the International Energy Agency, if the use of solar energy continues to develop at this rate, by 2050, 25% of the world's electricity needs will be met by solar energy, and 6 billion tons of carbon dioxide emissions will be reduced annually.

In 2022, the share of renewable energy in Morocco will be 38% of total installed electricity and the share of solar energy in total installed electricity will be 7.82%.

However, this resource is affected by climatic conditions and dust deposition. Climate change has increased sandstorms in the last decade, and this trend is expected to intensify in the coming years.

The performance of solar photovoltaic panels is affected by changes in the external environment, with air pollution, i.e. the accumulation of dust on the surface of the solar photovoltaic panel, being a major factor contributing to its efficiency.

Dust is any material or particle found in the atmosphere that is less than 500 μm in diameter, and this definition includes soil particles, smoke, volcanic fumes, pollen, microfibers, microbes, and limestone erosion. It is worth noting that dust is more prevalent in the Middle East and Africa. Various studies have examined the problems of dust types that accumulate on solar photovoltaic panels based on their optical, electrical, and thermal properties. Figure 1.

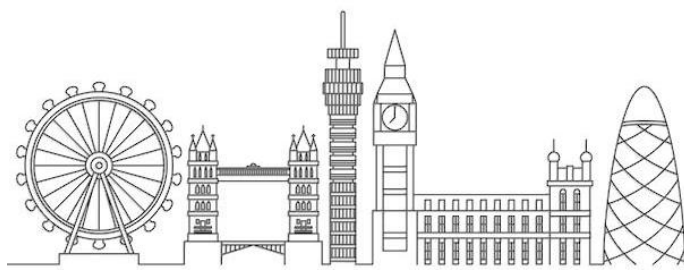




Figure 1. Miscellaneous type of dust. (a) dust samples, (b) the studied sun photoelectric to the panel bird's garbage fall.

Sun photoelectric panel on the surface pollution and dust to gather four main element effect makes; humidity, air pressure, radiation, wind and storm own inside received climate changes.

(1) In the expression photocurrent in expression for is used.

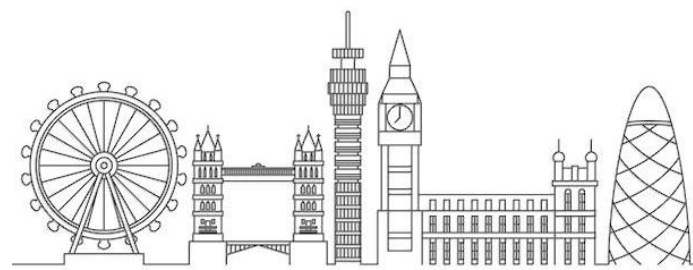
$$I_{ph} = \frac{I_r}{I_{r_0}} * [I_{sc} + K_I(T_m - T_{ref})] \quad (1)$$

this on the ground : I_r - solar radiation (W/m^2), I_{r_0} - radiation at STC ($1000 W/m^2$), I_{sc} - short at STC connection current (A), K_I - short connection of the flow temperature coefficient (A/K), T_m - solar element temperature (K), T_{ref} - solar at STC element temperature (K)

Monocrystalline sun photoelectric panel from pollen and dust cleaned in the state power, output voltage, output vines compared. Experience test for sun radiation $500 W/m^2$ for monocrystalline panel was held. Received results below shown. Monocrystalline MPP values for the dusted panel : $P_{max} = 50,9 W$, $V_{mpp} = 33,2 V$, and $I_{mpp} = 1,53 A$. Monocrystalline The MPP values for the cleaned panel are : $P_{max} = 53,6 W$, $V_{mpp} = 30,5 V$, and $I_{mpp} = 1,76 A$. When the two indicators are compared, the MPP values for the contaminated panel are : power clean from the panel 5% low efficiency determined.

Amorphous sun photoelectric panel experience was conducted under $470 W/m^2$ and $T = 26$ °C irradiation. The obtained results below shown : Amorphous MPP values for the powdered panel : $P_{max} = 40,69 W$, $V_{mpp} = 64,58 V$, and $I_{mpp} = 0,63 A$. Amorphous MPP values for the cleaned panel : $P_{max} = 74,65 W$, $V_{mpp} = 62,59 V$, and $I_{mpp} = 0,76 A$. Both indicators when compared polluted panel power clean from the panel 14% low efficiency determined.

Polycrystalline sun photoelectric panel for in the experiment $1200 W/m^2$ radiation under was held. Received results below shown : MPP values for dusty panel : $P_{max} = 181,68 W$, $V_{mpp} = 28,29 V$, and $I_{mpp} = 6,42 A$. MPP values for clean panel : $P_{max} =$





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194,04 W, $V_{mpp} = 29,04 V$, and $I_{mpp} = 6,60 A$. In Figure 2, dusty and dirty sun photoelectric panel power and voltage cited.

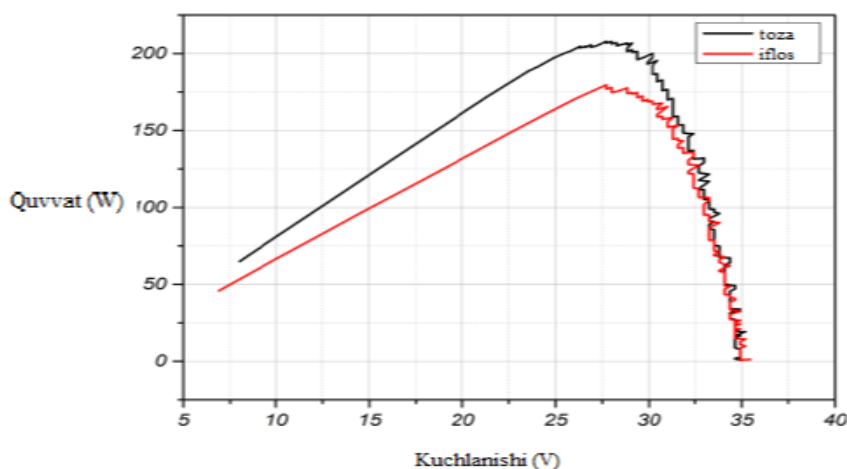


Figure 2. Polycrystalline sun photoelectric of the panel polluted and cleaned status

Conclusion: In the world energy in the system sun from energy in particular, the sun photoelectric from panels use developed They are going. to the efficiency pollution that is dustiness level increase impact Research shows. results this showed that pollination status or pollution every from 3% to 14% in both was power to disappear reason The sun will be photoelectric on the panel particles number increase with his/her efficiency decreases. From this except for monocrystalline silicon on the panel at a rate of 1.70% per year of power the most less deterioration showed, the power decrease polycrystalline silicon based on panels for 2.05% per year and amorphous silicon panels for 2.18% per annum organization reached.

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