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Performance Evaluation of Monocrystalline and Polycrystalline Photovoltaic Solar Cells

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Abstract: *The growing demand for clean and sustainable energy has accelerated the adoption of photovoltaic technologies, among which monocrystalline and polycrystalline solar cells are the most widely used. This study presents a performance evaluation of monocrystalline and polycrystalline photovoltaic solar cells based on key parameters such as energy conversion efficiency, power output, temperature sensitivity, and cost-effectiveness. The analysis highlights the structural and material differences between the two cell types and examines their behavior under varying environmental conditions, including solar irradiance and operating temperature. Experimental observations and comparative data indicate that monocrystalline solar cells generally exhibit higher efficiency and better performance in limited space applications, while polycrystalline solar cells offer a more economical solution with acceptable performance for large-scale installations. The study provides practical insights to assist in selecting suitable photovoltaic technology for residential, commercial, and industrial applications, contributing to informed decision-making in renewable energy system design.*

Keywords: Monocrystalline solar cells, Polycrystalline solar cells, Photovoltaic technology, Solar energy, Efficiency analysis, Renewable energy

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