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SolarPanelCleanerRobot

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Abstract:Dust accumulation presents a significant challenge to solar panel efficiency in Southeast Asia, aregioncharacterizedbyhighhumidity, industrialpollution, and seasonalhaze. This research investigates the impact of dust on photovoltaic performance, highlighting energy losses ranging from 17% to 50% depending on environmental and particulate factors. High humidity enhances dust adhesion, complicating removal and intensifying performance degradation. Conventional waterbased cleaning methods are shown to be in efficient and environmental ly unsustainable due to residue formation, frequent maintenance needs, and regional water scarcity. The study explores alternative solutions, including robotic dry cleaning, anti-dust coatings, and hydrophobic treatments, alongside the need for policy-driven pollution control. Sustainable solar energy production in Southeast Asia demands an integrated approach combining technological innovation with environmental regulation to mitigate the detrimental effects of dust on solar infrastructure.

Keywords: Solarcells; Dustaccumulation; Efficiency; Transmittance

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