Phase change materials integrated solar desalination system: An innovative approach for sustainable and clean water production and storage

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ABSTRACT

The demand for fresh water in today's world is rising continually due to the increase in population and rise in industrial developments. Solar Desalination is one of the sustainable and renewable ways to convert brackish or salty water into fresh water. The use of solar desalination contributes towards decarbonization, mitigation of CO_2 and other adverse global warming effect, and it contributes to the Sustainable Development Goals (SDG) number 6, 7, and 13. The solar energy-driven phase change materials (PCM) integrated solar desalination system simultaneously produces fresh water, and the excess heat energy can be stored in the PCM. The foremost objective of this review is to analyze the recent developments of solar-driven active and passive solar still (SS) with thermal energy storage. Also, this review analyzes the effect of wind, depth of water, the thickness of PCM, and intentions to fill the gap in the available reviews on distillate production and highlights the improvement techniques of various active and passive SS with and without PCM. Furthermore, it highlights the effect of nanoparticles enhanced PCM integrated solar still with different absorber designs and configurations. The reviews shows that the maximum freshwater production is 13.62, 15.39, and 18.6 L/m^2day for Evacuated tube collector (ETC) integrated solar still, parabolic trough collector integrated solar still, solar still with PCM-graphite nanoparticles, and solar still with PCM-graphene oxide nanoparticles, respectively. The information helps identify the most appropriate combinations of solar-driven desalination systems with PCM to fulfil the SDG for small and large applications.

KEYWORDS
Solar desalination; Sustainable and clean water; Phase change materials; Solar still; Thermal energy storage

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