Energy Saving Coating Materials
Design, Process, Implementation and Recent Developments
2020, Pages 1-32

Chapter 1 - Solar radiation and light materials interaction

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https://doi.org/10.1016/B978-0-12-822103-7.00001-7

Abstract

Our primary source of clean, abundant energy is the sun; the sun deposits 120,000 TW of radiation on the surface of the Earth, far exceeding human needs even in the most aggressive energy demand scenarios. All routes for utilizing solar energy exploit the functional steps of *capture, conversion, and storage*. The sun's energy arrives on earth as radiation distributed across the color spectrum from infrared to ultraviolet having wavelength in the range from 2.5 to 0.28 μm. The energy of this radiation must be captured as excited electron-hole pairs in a semiconductor, a dye, or a chromophore, or as heat in a thermal storage medium. This chapter describes the different ways of utilizing the energy coming from the solar radiation, which has opened new avenues for generating clean energy by solar energy conversion: solar electricity and solar thermal systems. To get the maximum efficiency of solar devices, it becomes important to tailor the properties of solar energy materials, that is, to maximize the usage of solar spectrum. One method of achieving the higher efficiency is to use the effect of nanoscale for enhancing photon management in the photovoltaic cell. The other way is to look for several ways of minimizing energy utilization, as conservation of energy is the most effective way of reducing CO_2 concentration. It has been discussed that it can be achieved by using a unique class of materials called as Solar Energy Materials, for thermal applications, which have optical properties that make them well adapted for utilizing solar energy and for reaching energy efficiency, especially in the built environment.