Control of porphyrin dye aggregation using bis(4-pyridyl)alkane spacers in dye sensitized solar cells

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Dye aggregation on semiconductor surface is a serious issue that needs to be prevented for the efficient performance of dyes sensitized solar cells (DSSCs). The aggregation of sensitizers decreases the charge injection kinetics. Photoexcited aggregated molecules do not participate in electron injection due to charge annihilation. Moreover, dye aggregation may cause increased charge recombination with dye cation [1]. Porphyrins, a well known class of DSSC sensitizers, also tend to aggregate on photoanode surface [2]. Methods of aggregation control include the incorporation of bulky groups on dye structure which can be synthetically challenging and / or the use of coadsorbates that requires preparation of cocktail with optimal dye-coadsorbate ratio. In this research we present the use of bis(4-pyridyl)alkanes as effective spacers between porphyrin dyes that prevent dye aggregation by axially complexing with dye metal atom. This allows the use of dyes with no bulky groups and makes possible to control the distance between sensitizer molecules.

[1] Hiroyuki Matsuzaki et al. *J. Phys. Chem. C* 2014, 118, 17205−17212
[2] Hsueh-Pei Lu et.al. *J. Phys. Chem. C* 2009, 113, 20990–20997

Calculation of exergy analysis of different types solar collector systems in conditions of Kazakhstan climate

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In the work herein we have conducted calculation of exergy (heat losses) of different types of solar collector systems with the aim to find the best version for heating and hot water supply under Kazakhstan climatic conditions. To achieve the aim there has been applied the mathematical model, representing the set of formulae for sequential elemental computation of the system, temperature data on the solar water heating system. There has been constructed the algorithm for computing the heat losses of the solar water heating system and solar thermal pump. Timeliness of the obtained results is very high, the algorithm allows conducting computation to detect ineffective components of the heating system.