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Special column: solar energy conversion

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It is a great challenge to meet the increasing energy requirement due to the increase of the population and the improvement of the living standard. As the largest single available source of clean energy, the sun deposits 120000 TW of radiation on the earth. The efficient use of solar energy would be a promising solution for the energy issue. Therefore, great efforts were made to develop solar technologies, such as solar cells, photocatalysis, photoelectrical catalysis, and photothermal devices. In this special column, six articles in solar energy conversion have been accepted for publication.

As the first part, three review articles are focused on materials for solar energy conversion. In a mini-review, **Chen and Jin** summarized the recent progress in titanium oxide catalysts for photoreduction of carbon dioxide. The structural engineering was emphasized as a strategy to improve the catalytic performances of titanium oxide. **Zhang and Zhang** provided another review article on CO₂ photoreduction over various metal-organic frameworks (MOFs) catalysts, including functionalized pristine MOFs, MOF-photosensitizer, MOF-semiconductor, MOF-metal, and MOF-carbon material composites. Furthermore, **Rashidi et al.** reviewed the applications of MoS₂ nanosheets in solar thermal water purification, photocatalysis, and photoelectrocatalysis.

Three research articles constitute the second part. **Tudu et al.** demonstrated a pathway for future planning of scaled-up hybrid energy systems or microgrid in the region of India or regions of similar topography. They revealed the optimal capacity for the nano-grid system. **Zou et al.** constructed a 3D numerical model of cylindrical solar cavity receiver with direct normal irradiance (DNI) variation, in which the heat losses of the cavity and heat transfer of working medium were taken into account. Furthermore, the best design of the cavity receiver with the highest thermal efficiency was demonstrated in a particular DNI in the range of 400 to 800 W/m². In the last article, **Padmagirisan and Sankaranarayanan** proposed a powertrain controller for a solar photovoltaic battery powered hybrid electric vehicle (HEV). The simulation and experimental results were presented to confirm the feasibility of the proposed technique.

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