Session	Advanced Coating Technologies (I)
Date	APRIL 10, 2025
Time (CET)	15:35 - 16:05
Chair	Ozan Özer

INVITED SPEAKER

Hollow Silica Nanosphere Based Anti-Reflective Coatings on Photovoltaic Glasses

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Biography

Xusheng Qiao, an associate professor at Zhejiang University, vice dean of Institute of the inorganic and non-metallic materials, and director of Zhejiang University – Assure Joint Research Center. He has led over ten national research projects and published over 100 scientific papers on journals such as Nature Communication, ACS Nano and Adv. Science. He teaches the courses of “Fundamentals of Materials Science” and “Solid-state Chemistry” and is collaborating with international groups on glass and glass-ceramics.

Abstract

Anti-reflection (AR) coatings can suppress the reflection of light on the surfaces or interfaces so as to enhance light harvest efficiencies as well as photovoltaic efficiencies of solar cells. It usually requires an increment of the optical transmittance in the front panel surface of solar cells. Among various anti-reflection coatings, it has been considered as one of the most promising methods to fabricate porous AR coatings with the sol-gel method. How to control the stability of coating sol and improve the mechanical properties of AR films is the key issue for mass production. In our study, high performance hierarchical nanoporous AR films were developed through dip coating hollow silica nanospheres (HSNs) and block copolymer F127 containing inorganic/organic composite sol onto solar cell cover glasses. With the introduced steric effect and surface modification, it suppressed the aggregation of nanospheres so that the sol showed better stability. After annealing, the transmittance of AR coated glass still held the transmittance of 96 % at 550nm. The nano-scale surface embossments due to the addition of HSNs was also contributory to the AR effect of the films. The mechanical performance of the AR film was further strengthened to 6H through compositing SiO2, Al2O3 or TiO2 sol as binders. The composite sol can keep stable at least one month at ambient temperature without any visible precipitation. Therefore, the proposed method is promising to effectively and economically fabricate high performance AR films.

Co-authors

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References

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