

# Soiling mitigation potential of glass coatings and tracker routines in the desert climate of Saudi Arabia

Muhammad Zahid Khan<sup>1</sup>, Guido Willers<sup>1</sup>, Abdullah Ali Alowais<sup>2</sup>, Volker Naumann<sup>3</sup>, Mark Mirza<sup>4</sup>, Erik Grunwald<sup>3</sup>, Hussam Qasem<sup>2</sup>, Ralph Gottschalg<sup>1</sup>, and Klemens Ilse<sup>3</sup>

<sup>1</sup>Hochschule Anhalt

<sup>2</sup>King Abdulaziz City for Science And Technology

<sup>3</sup>Fraunhofer-Center fur Silizium-Photovoltaik CSP

<sup>4</sup>Fraunhofer-Institut fur Silicatforschung ISC

April 3, 2023

## Abstract

High levels of airborne dust, frequent dust storms and infrequent rain events are some of the reasons why soiling can drastically reduce the energy yield of photovoltaic modules in desert areas. There are ongoing and increasing efforts to identify appropriate and economically feasible strategies that can be used to mitigate soiling in deserts. Both innovative tracking with adapted resting positions during night and anti-soiling coatings (ASC) are considered as potential solutions to reduce soiling. In this study, the individual mitigation potential of both ASC and tracking routines as well as the combination of the two approaches are investigated. For this, outdoor exposure tests were carried out in desert region of Saudi Arabia. Coated and uncoated glass samples were tested in different tilt configurations: fixed, 1-axis tracking with horizontal stowage (facing the sky) and 1-axis tracking with vertical stowage during the night. Both methods indicate significant soiling reductions, especially for the combined solution of ASC and tracking with vertical night stowage, where soiling losses can be reduced by up to 85%. In addition, it has been shown that by adapting tracking, the relative ASC performance can be improved compared to fixed tilt or standard 1-axis tracking scenarios.

## Hosted file

pip-23-137-File001.docx available at <https://authorea.com/users/602584/articles/633367-soiling-mitigation-potential-of-glass-coatings-and-tracker-routines-in-the-desert-climate-of-saudi-arabia>