

Current Projects on “Vehicle-Integrated PV”

“PV2Go” – Citizen Science Campaign to Measure Solar Radiation on Roads

In order to determine the solar radiation potential of passenger cars, we are currently investigating and measuring solar radiation on German roads as part of a citizen science campaign with 80 vehicles. The data will be used in new simulation models for solar radiation on traffic routes. This would allow drivers to calculate how far they could drive with solar energy, at what time and on which route.

- development of a 3D model of the solar potential on traffic routes in the course of the day and the year, including the local shading situation.
- irradiation measurements on vehicles of commuters, families and commercial vehicles
- alignment with satellite-based irradiation data

“3D” – Modules for Integrated Photovoltaics

The integration of photovoltaics into existing surfaces, devices and covers requires new module designs and thus also module manufacturing processes. Curved modules can be used in the roofs of e-vehicles, for example.

- development of an industrial laminator and the required processes and module concepts
- development of methods for mechanical and electrical characterisation

Further Information



ise.link/vehicle-integrated-pv



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Integrated Photovoltaics

Solar Power On-board

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Current estimates indicate that over 70 % of all newly registered vehicles in Germany will be electrically powered from 2028 onwards, some of them as hybrid vehicles. Integrated solar cells generate electricity on-board and noticeably increase the ranges of electric and hydrogen vehicles.

The solar modules developed at Fraunhofer ISE are equipped with highly efficient solar cells integrated into the vehicle body. The technology of laminating solar cells in curved shapes is a completely new process. With the low additional costs, the self-charging of the battery and the integration into the vehicle design, the pv modules meet the expectations of vehicle manufacturers and drivers.

Our Services for Vehicle Manufacturers and Suppliers

- module technology consulting
- development of efficient module technologies for integrated photovoltaics
- production of prototypes for vehicle shells
- analysis of solar yield potential for usage profiles, regions or routes
- module testing and service life analysis
- development of energy and load management as well as power electronics and battery systems
- cost analysis
- coordination and management of R&D projects with industry partners



Visualisation of a solar car roof with IBC cell technology.

Durable and Highly Efficient Solar Modules

Solar modules in vehicles must function reliably over the service life of the vehicle despite strong vibrations and impacts. Our many years of experience in the development of module technology form the basis for safe and long-lasting power generation in vehicles.

- optimized module concept minimizes yield losses due to partial shading and curvature of the car
- module tests according to relevant standards for commercially available photovoltaic modules
- designed for the increased mechanical and thermal loads in road traffic
- measurement setups for PV modules in our accredited laboratories.

Increased Range with Integrated Solar Cells

The limited surface area of the car is used in the best possible way by highly efficient and cost effective solar cells. The power density of our solar car modules can reach 210 W/m². Solar glass roofs alone provide sustainable electricity for daily driving distances of up to ten kilometres. The calculated driving

distance is based on solar radiation on a sunny summer day in an open area in southern Germany and a vehicle consumption of 17 kWh per 100 kilometres.

High Aesthetics through Color Coating

The solar cells are designed to integrate completely and as invisibly as possible into the vehicle body. We have developed an optical structure that conceals the cells underneath. Morpho-Color® offers vehicle manufacturers many benefits:

- any color choice with high saturation
- coloring and intensity independent of the viewing angle
- transmission loss through Morpho-Color® averaging only 7 % relative (compared to uncoated glass).



Visualisation of a car roof with (left) shingle technology and (right) wire interconnection technology.