BMBF LIGHTHOUSE PROJECT SMILE

- Objectives, Contents, Results -

02.04.2019 – Forum TechTransfer auf der Hannover Messe

Kontakt



Dr.-Ing. Philipp Rosenberg Group leader Structural Composites Fraunhofer-Institute for Chemical Technology ICT Philipp.Rosenberg@ict.fraunhofer.de



Project SMiLE - overview and main objectives -

SMiLE* - System-Integrated Multi-Material Lightweight Concept for Electro Mobility

- Project volume: 33.2 Mio. € → Funding rate 50%
- Project duration: 01.09.2014 20.02.2018

Project goal and results:

- Technology development for holistic Multi-Material lightweighting
 - Material- and Process technology, joining technology, low temperature coating processes



- Integration of new materials and technologies in a car body with electric drive train using the multi-materials design approach
 - > Weight reduction by functions integration near the limits of the technological feasibility



IMORII ITAT

*Awarded as one of three BMBF Lighthouse projects for E-Mobility

Project SMiLE - technical objectives



SMiLE - Project Structure

Project end 02/2018 Project start 09/2014 **WP 1** BEV body concept and design Fiber reinforced **thermoset** composites **WP 2** Thermoset front floor Fiber reinforced thermoplastic composites **WP 3** Thermoplastic rear floor WP 4 Non-ferrous metal Joined floor module WP 5 Joining technology for electric verhicles in multi-material design Low-temperature coating process WP 6 WP 7: Body assembly and evaluation

Floor module installed in SMiLE car body



SMiLE – Composite components and their integration



SMiLE – thermoset front floor (CFRP & pressure controlled RTM)





Process

ultra-RTM

120 -

80 55

40

0

Pressure in bar



SMiLE – process chain for the thermoplastic front floor



1) Stack transfer

- 2) Sequential draping
- 3) Final Preform





5) Preform placed



7) Injection with PC-RTM

8) Part ready for demolding



SMiLE – thermoplastic rear floor (tapes, D-LFT)



Process

- Low thickness/high stiffness: continuous tapes
- Reinforcments of the structure w. ribs: D-LFT

\rightarrow local advanced tailored LFT





SMiLE – summary and outlook

- A lightweight Multi-Material car body was developed
- Structural integrity was considered & crash requirements were validated on component level
- The composites manufacturing processes were designed for 300 vehicles / day
- A virtual process chain was developed for cost optimization

Car body weight SMiLE: 209 kg

- 153 kg weight reduction compared to E-Golf
- Overall lightweighting cost < 7 €/kg</p>
- Big & functions integrated modules allow significant cost reduction with CFRP materials





Thank you!





Philipp.Rosenberg@ict.fraunhofer.de 10

Dr.-Ing. Philipp Rosenberg

Kontakt