

Outline of the Project

Background: CO₂ emissions must be reduced significantly in order to achieve a carbon-neutral society by 2050. Given the massive size (65 trillion yen) of the worldly transportation and auto market in Japan, lightweighting vehicles and making them easier to disassemble at end of life are crucial to lowering emissions and creating a circular economy.

Purpose: The key to lightweighting a car body lies in adhesive bonding of dissimilar materials. We aim to achieve vehicle adhesive joint that are structurally strong and durable, yet can be debonded, re-bonded and circulated the vehicle resources easily, while meeting end-of-life vehicle (ELV) scrapping requirements.

R&D: Focusing on the adhesive interface, we will undertake the following:

- (1) Optimization of the interface design, (2) analysis of mechanism, (3) indexes of evaluation,
- (4) Development of equipment capable of easily debonding for circulating resources of vehicle bodies.

Multi-material body



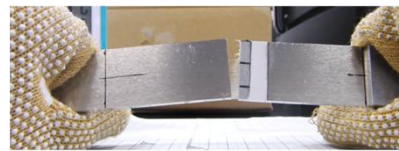
Strong and stable during manufacturing
> 20 MPa

Long-term stability



Predictable stable cohesive failure
> 95% after 10 years

Disassembly/Circularity of ELVs



Achieving both strength/durability and debonding/resource circulation

Debonding & re-bonding (> 10 cycles)

Accomplished

Ongoing

Significance of International R&D

- We will collaborate with Technische Universität Braunschweig, a major German educational institute leading the world in automotive manufacturing innovation. TU Braunschweig is pioneering joining and debonding devices for circulating resources of vehicle bodies in anticipation of European ELV regulations.
- Collaboration between Germany and Japan, world leaders in auto manufacturing as well as adhesives research, will lead to the establishment of international standards for easy vehicle disassembly and recycling through adhesives. This will in turn accelerate the widespread use of bonding in the auto industry and create new value in the adhesives industry in the era of the circular economy.

Project Scheme

NEDO

Funding

AIST

National Institute of Advanced Industrial Science and Technology

Joint R&D contract

TU BS

Technische Universität Braunschweig German

Expected Outcomes

Debonding of adhesive joints: Process and design transformation in auto industry; widespread use of adhesives equaling lighter-weight vehicles and faster CO₂ emissions reductions.

Expected CO₂ reduction: If adhesive use becomes widespread by 2040, 10% of new cars will be 100 kg lighter, and emissions will be reduced by 2.16 million tons per year. If 1.92 billion vehicles worldwide are each 100 kg lighter, this would be equivalent to a potential reduction of 380 million tons of CO₂ per year.

Additional benefit: Japan will gain an edge and bigger share of the world market for multi-material vehicles and components.