

# Experimental Study on Fatigue Life Performance of Multi-Material Connections Hybrid Joined by Self-Piercing Rivets and Adhesive

Jan Presse<sup>1</sup>, Throsten Michler<sup>2</sup>, and Boris Künkler<sup>1</sup>

<sup>1</sup>Opel Automobile GmbH

<sup>2</sup>Fraunhofer Institute for Mechanics of Materials IWM

April 28, 2020

## Abstract

The represented multi-material design contains an aluminium EN AW-6016 and a high strength steel CR330Y590T-DP. This dissimilar combination is an example for affordable lightweight design solutions, but it requires an adapted joining technology. Hybrid joining technologies such as self-piercing riveting (SPR) in combination with a structural adhesive enable an assembly of such dissimilar material combinations. Besides higher manufacturing costs for mechanical joining the design process still requires a great amount of effort. This study provides a simple approach to assess hybrid joined multi-material connections. Therefore, tests on several combinations of the most relevant parameters on the fatigue life (material properties, sheet thicknesses, load cases) were performed under quasi-static and cyclic loads. Based on the data acquired, it is shown that the fatigue life of the hybrid joined connections can be estimated by superposing the contributing fatigue lives of the purely SPR and purely adhesive joints.

## Hosted file

20200326-Paper.docx available at <https://authorea.com/users/306379/articles/437377-experimental-study-on-fatigue-life-performance-of-multi-material-connections-hybrid-joined-by-self-piercing-rivets-and-adhesive>