Distortion in polymer-metal-hybrids due to adhesive bonding

**Background**
Adhesive bonding is becoming a more and more important joining technology. The adhesive cure process, however, can cause local and global distortions of the adherends, especially when thin-walled structures are involved.

**Experiments**
In order to quantify local distortions, tests with a certain specimen are performed. In an experimental setup the displacement of a steel sheet is monitored over time for different temperature cycles.

**Results**
Displacements curves over time for different temperature cycles are obtained. Distortions develop in two distinct parts; the first part can be linked to a combination of chemical shrinkage and thermal strain, the second one is caused by thermal deformation during the cooling down. The low temperature rate affects the first part significantly.

**Future work**
At the moment work is done on a simulation model which takes the temperature- and degree-of-cure-dependent as well as the viscoelastic properties of the adhesive into account. The results of the simulation will be compared with the experimental data obtained.

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**References**
- Eis, M., Fertigungsbedingte Bauteildeformationen beim Kleben dünnwandiger Stahlbauteile: Analyse der Entstehungsmechanismen und Hinweise zur Minimierung, Universität Paderborn, 2000