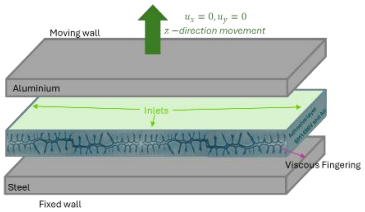
Studien- / Bachelor- oder Masterarbeit

Predicting Bonding Area Reduction in Hybrid Joints due to Viscous Fingering

In multi-material lightweight designs such as aluminum-steel hybrid structures adhesive bonding is essential. However, during the bonding process, phenomena like viscous fingering can cause instability, reduce the effective bonded area and compromise joint integrity. This research will investigate how such fingering patterns develop in thin adhesive layers under varying bonding layer temperatures and degrees of curing. Using advanced viscoelastic constitutive models (FENE, Rolie-Poly, XPOM-POM), the aim is to predict bonding area reductions and optimize process parameters.

- Compare FENE, Rolie-Poly, and XPOM-POM models for predicting stress-strain & shear-viscosity behavior
- Implement these models with moving wall conditions to simulate the bonding process by using ANSYS/ OpenFOAM
- Investigate sensitivity of key parameters (relaxation times, stretch coefficients)



Your benefits and learning outcomes	▪ Hands-on experience with applied mathematical modeling and simulation ▪ Gain expertise in advanced rheology, viscoelastic modeling
What should you bring with you?	▪ Fundamentals of fluid mechanics and rheology ▪ Interest in viscoelastic material modeling and polymer physics Basic experience with CFD software (OpenFOAM, ANSYS, COMSOL)
Begin	right away

Contact

Name MSc. Muhammad Bilal Hafeez
Office E3.350
E-Mail Muhammad.bilal.hafeez@uni-paderborn.de