TU Darmstadt | FB11 | Physical Metallurgy | Peter-Grünberg-Straße 2 | 64287 Darmstadt

TECHNISCHE UNIVERSITÄT DARMSTADT

Bachelor Thesis / ARL / Master Thesis

Title: Determination of Transverse Shear Stress in Cantilever Bending of Multilayer Diamond Laminate Using Finite Element Modelling (FEM)

Diamond metallic laminates are multilayered structures composed of CVD-grown diamond layers and PVD-deposited metal interlayers. This project aims to investigate their failure behavior to enhance their performance in abrasive and corrosive wear environments. It is a DFG-funded project and collaborative effort between the Materials Science and Engineering for Metals at FAU Erlangen-Nürnberg and the group of Physical Metallurgy at TU Darmstadt.

Delamination is the one of the major failure mode in multilayer systems. In flexural loading scenarios, the stress component primarly responsible for initiating delamination is the transverse shear stress (TSS). When TSS exceeds the interfacial strength, it can lead to separation between layers. Therefore, understanding this stress component is crucial, as it forms the foundation for effective interface design and optimization.

Tasks/Questions

- 2D cantilever models to verify elastic response of the monolayer and laminate
- Extracting through thickness transverse shear stress (TSS) from cantilever simulations
- Exploring the possibility to design a cohesive interfaces using output parameters derived from TSS analysis

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