# *Technische Universität Berlin*

Zum Aushang und zur Kenntnisnahme

**Fakultät V**
**Verkehrs- und**
**Maschinensyste-**
**me**

Institut
für Mechanik

**LKM**
Lehrstuhl für
Kontinuumsmechanik
und Materialtheorie

Univ. Prof. Dr. rer. nat.
Wolfgang H. Müller

| Ihr Zeichen | Ihre Nachricht vom | Unser Zeichen | ☎ (030) 314-27682/ 22332 | Datum |
|---|---|---|---|---|
| | | WHM | | 19.10.2009 |

## Seminarankündigung

Frau Dr. Vera Petrova, Voronezh State University, University Sq.1, Voronezh 394006, Russia, email Vera.Petrova@math.vsu.ru, derzeit zu Gast bei Prof. Siegfried Schmauder am MPA der Universität Stuttgart, hält im Mechanikseminar am Mittwoch, den 21.10.2009, MS107, 16:15 Uhr einen Vortrag zum Thema:
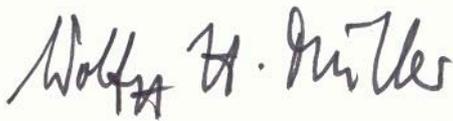
*Crack – Interface Crack Interactions in Functionally Graded/Homogeneous Bimaterials Subjected to a Heat Flux*

Abstract:

The work is devoted to the study of thermal fracture of a bimaterial compound consisting of a functionally graded material (FGM) and a homogeneous one with an interface crack and internal defects subjected to a heat flux. FGMs are often used in different engineering structures and are tailored so that to decrease bimaterial mismatch at interfaces and in order to prevent delamination/ debonding at the interfaces. Meanwhile, the interaction of cracks, defects and interfaces causes additional stresses near interfaces and can lead to enhance or suppress crack propagation as well as to change the initial crack paths and cause crack kinking. In this connection the influence of crack locations and orientations and parameters of the nonhomogeneity of FGMs on the stress‑strain state in the vicinity of interfaces and on the behavior of an interface crack is investigated. The study is based on the solution of the above mentioned problem in the case when an interface crack is much lager than internal cracks in the FGM. It is assumed that the thermo‑mechanical properties of the FGM are continuous functions of the thickness coordinate and have exponential form. The uncoupled, quasi‑static thermoelastic theory is applicable to this problem so that the solution consists of the determination of the temperature distribution, and the determination of the thermal stresses. Asymptotic ana-

lytical formulas for the thermal stress intensity factors at the interface crack tips are obtained as a series of a small parameter (the small parameter is equal to the ratio of the size of small internal cracks to the interface crack size). The critical heat flows and the angles of direction of the initial crack propagations are calculated in accordance with the maximum circumferential stress criterion (Cherepanov, 1963; Erdogan and Sih, 1963; Panasyuk and Berezhnitskij, 1964). The results of the present study can be used for modeling the residual stress‑strain distribution near interfaces and an interface crack and then for modeling the behavior of cracks in a graded bimaterial joint (FGM /homogeneous). These results are applicable to such kind of FGMs as: some ceramic/ceramic FGMs, i.e. TiC/SiC, MoSi2/Al2O3 and MoSi2/SiC, and also some ceramic/metal FGMs, i.e. zirconia/nickel and zirconia/steel.

Alle sind herzlich willkommen !

(Wolfgang H. Müller)