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Mechanik-Seminar

Referent: **Prof. Ádám Kovács**
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Datum: Donnerstag, 14.02.2008
Uhrzeit: **16.30 Uhr**
Ort: Hertz-Hörsaal, Geb. 10.11, Raum 126

Thema: **"Estimates for the load capacity of multi-layered porous nanofilters"**

Abstract

Perforated and porous membranes are often used in various engineering applications. As an example, they can serve for micro- and nanofiltering purposes in micro-electromechanical systems (MEMS). Investigated membranes are made from very thin perforated silicon-nitride (SiN) on a porous polysilicon (PS) layer, which is supported and reinforced by single-crystal silicon (c-Si).

The performance of filters highly depends on the porosity. In order to obtain higher filtration rate the porosity should be as high as possible which diminishes the strength, and consequently, the load capacity of the device. This effect can be compensated by the application of SiN support layer and c-Si columns as a support grid within the PS-layer. In order to estimate the load capacity of the membrane the elastic and fracture material properties of the structure should be known. Since elastic modulus and fracture strength are both dependent not only on the porosity but also on the thickness of layers, the use of effective material properties could simplify the numerical estimation of bursting pressure in the design phase.

Different filter-configurations have been analyzed. They differ in the thicknesses of SiN and PS layers as well as the etching rate and column-width of c-Si. The elastic modulus and the fracture strength for full structures have been determined by experiments for different layer-thicknesses.

Based on thin and thick-plate bending theory some analytical estimates were given to determine the load-capacity of the layers. These estimates have been then extended for the complicated multi-layer structure using finite element simulations.

Alle Interessenten sind herzlich eingeladen.
Prof. Dr.-Ing. Carsten Proppe