



INTERDISCIPLINARY CENTRE FOR
ADVANCED MATERIALS SIMULATION

MMM Seminar

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workshop room UHW 12/1222

**Cohesive zone modeling
of brittle coatings on a ductile substrate**

Hard coatings are used for increasing the wear resistance of different components. The cracking mechanisms and adhesion of such coatings can be modeled by using cohesive zone elements. Present work considers the effect of material properties on the stress transfer mechanisms and the evolution of stress distribution on the coating surface. The results will be helpful in designing the cohesive zone models, where cohesive elements will be applied in the regions of high stresses. Diamond coatings on Titanium substrate have been studied for the effects of elastic and plastic material properties, change in substrate and coating thickness, effect of residual stresses and the effect of size of the crack segment. The evolution of stress profile on the coating surface is studied as a function of applied strain. The results show that the yield point and Young's modulus of the substrate play an important role in stress transfer from the substrate to the coating. Higher the value of these two factors more will be the amount of stress transferred into the coating. Furthermore, residual compressive stresses delay the onset of reaching of fracture stress in the coating. It was also found that the maximum stress always lies at the middle of the crack segment hence the segments should always break in the middle, during the cohesive models.