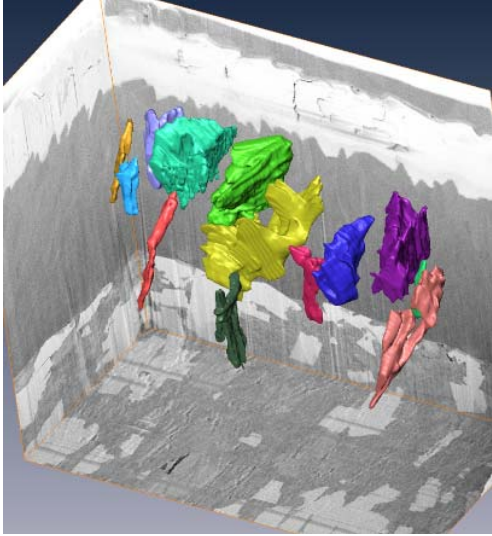


## DocMASE Project Proposal 2014-01

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|---|---|
| Project Title   | <b>Investigations on wear mechanisms for formation of comb cracks in coated tools</b>   |
| Main University and Advisor   | Saarland University, Prof. F. Mücklich and Dr. F. Soldera   |
| Second University and Advisor   | Technical University of Catalonia, Prof. Luis Llanes  |
| Associated Partner(s) (if applicable)   | AB Sandvik Coromant R&D, Priv-Doz. Dr. J. L. Garcia   |
| Project Description (with <b>image</b> , if applicable)   | <p>Comb cracks are the main wear mechanism in coated cemented carbide tools subjected to milling operations. They arise due to the intermittent interaction of the tool with the working piece, where the material is exposed at high impact loads and high temperatures. Understanding the wear mechanisms of comb cracks is a complex subject since many mechanisms are acting simultaneously at the cutting edge, i.e. mechanical, thermal and chemical. Furthermore the problem combines a composite material (cemented carbide/coating) with a defined interface. This work aims at investigating the formation and propagation of comb cracks in coated cemented carbides considering all effects at the different scales. The comb crack formation, propagation and 3D arrangement will be investigated on different coating/cemented carbide systems focusing on the effect of the coating microstructure, architecture and composition; the composition, microstructure of the cemented carbide and the interface coating/substrate design. Three dimensional characterization will be carried out by 3D Focused Ion Beam tomography. Model systems will be evaluated under ideal wear conditions; i.e. pure mechanical load, or temperature load and compared to the observed wear pattern in the application. Furthermore, the results of the investigations may be used as input for future modeling, such as finite element or phase field simulation.</p>  |
| Previous Publications   | <p>J. Garcia et al. Design and characterization of novel wear resistant multilayer CVD coatings with improved adhesion between Al<sub>2</sub>O<sub>3</sub> and Ti(C,N) <i>Advanced Engineering Materials</i> 12, No. 9 (2010) 929-934</p> <p>E. Tarrés et al. Contact Fatigue Behavior of PVD-Coated Hardmetals <i>International Journal of Refractory Metals and Hard Materials</i> 27 (2009) 323-331</p>  |
| Requirements of the candidates / Requirements during the doctoral programme (courses, seminars, etc.) | <p>Very good English command.</p> <p>Bachelor in Materials Science, Chemistry, Physics or related disciplines.</p> <p>Master in Materials Science or related disciplines.</p> <p>Previous experience in metallography, quantitative image analysis, 3D image processing and FIB/SEM will be of advantage.</p> <p>30 ECTS must be acquired during the program according to the minimum requirements of DocMASE.</p>  |