



UNIVERSITÀ
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Training Course

FRACTURE MECHANICS OF SUPERHARD AND BRITTLE MATERIALS

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COURSE DESCRIPTION

This course explains a combined experimental/numerical study of the fracture of superhard brittle polycrystalline materials (commercially available polycrystalline diamond grades in this case) that has been performed at the continuum and microstructural levels leading to an improved understanding of fracture phenomena in these materials. In order to extend the capabilities and potential application areas of the material, there is a need to undertake significant fundamental research into the properties of this material under conditions that occur in typical cutting processes. It will be presented how mechanical and fracture properties of superhard brittle material can be obtained at a wide range of loading rates and temperatures which are representative of typical drilling conditions. Microscopic examination and numerical simulations performed are linking the numerical results with the experimental observations proposing a structure-property relationship for these grades of material. The course leads to understanding of the behavior of superhard brittle polycrystalline materials and consequently allows recommendations to be made for the improved design of the material itself and of the corresponding manufacturing processes.

COURSE PROGRAM

Day	Lesson	Time
19/02	Fracture mechanics of superhard and brittle materials – Polycrystalline Diamonds	14,00 – 16,00
20/02	Experimental determination of mechanical properties of PCD	14,00 – 16,00
	Quasistatic Young's modulus tests	
	Dynamic Young's modulus tests	
	Flexural strength tests	
21/02	Experimental determination of fracture properties of PCD	14,00 – 16,00
	Fracture toughness at quasistatic rates	
	Fracture toughness at dynamic rates	
	Apparent vs. true fracture toughness	
	Fractographic analysis	
22/02	Lab tours and discussion	14,00 – 16,00

LOCATION

MS1 Meeting Room - Department of Civil Engineering and Architecture, University of Pavia.