**CP 2021**

**The 7th International Conference on Crack Paths**

*online and on-demand*

September 21-24, 2021

THIS INFORMATION WILL BE USED TO SET UP THE CONFERENCE PROGRAM

**THEMATIC SYMPOSIUM SELECTION**

(a description of each TS is provided in the website: *cp2021.crackpaths.org*)

|  |  |
| --- | --- |
| **TS1** | Notch fatigue strength in the presence of intrinsic defectiveness and/or complex multiaxial loading |[ ]
| **TS2** | Damaged nanocomposites and nanostructures with cracks and discontinuities using local and nonlocal models |[ ]
| **TS3** | Crack Path in VHCF regime |[ ]
| **TS4** | Crack path simulation using numerical discrete approaches |[ ]
| **TS5** | Propagation and significance of cracks in railway components |[ ]
| **TS6** | Fatigue and fracture of additively manufactured materials and structures |[ ]
| **TS7** | Mixed-mode fatigue and fracture problems: experimental tests and theoretical predictions |[ ]
| **TS8** | Crack path in AM components using X-ray tomography |[ ]
| **TS9** | Fatigue crack growth and orientation criteria: considerations about crack front direction, shape and plastic phenomena |[ ]
| **TS10** | Damage, homogenization and crack problems in elastic media |[ ]
| **TS11** | Fretting fatigue cracks: experimental and modelling techniques |[ ]
| **TS12** | Meso-scale modelling of short-crack propagation in fretting fatigue: theoretical analysis and experimental validation |[ ]
| **TS13** | Crack path analysis and prediction in materials and structures |[ ]
| **TS14** | Crack path in innovative eco-materials |[ ]
| **TS15** | Fracture of anisotropic materials under uniaxial and multiaxial loading |[ ]
|  | **NO THEMATIC SYMPOSIUM** |[ ]

**Fracture toughness of cement composites reinforced**

**by a biocompatible nano-material**

**Sabrina Vantadori1, Andrea Carpinteri1, Camilla Ronchei2, Daniela Scorza3, Andrea Zanichelli1, Giacomo Magnani4, Daniele Pontiroli4, Mauro Riccò4, Michele Sidoli4**

*1Department of Engineering and Architecture, University of Parma,*

*Parco Area delle Scienze 181/A, , 43124 Parma, Italy – sabrina.vantadori@unipr.it*

*2Department of Civil Engineering, University of Calabria*

*3Department of Engineering, University of Naples Parthenope*

*4Department of Mathematical, Physical and Computer Sciences, University of Parma*

|  |  |  |
| --- | --- | --- |
| *Fracture toughness* | *Cement composites* | *Nano-material* |

**Abstract** The aim of the present paper is to investigate flexural strength and fracture toughness of a Portland limestone cement paste reinforced by graphene oxide (GO) sheets. Although cement composites have been widely used worldwide as the main building material up to now, their main features are high compressive strength and low tensile and flexural strength. Such a brittle behavior is due to pre-existing flaws in the paste. Recent advances in nanotechnology have led to the production of nanosized particles, which can be used as a reinforcement to prevent the formation and propagation of microcracks at the outset. As a matter of fact, such particles can control nano-sized cracks before they evolve to micro-cracks. GO is also included in the category of nano-materials. More precisely, GO sheets can control the microstructure of crystals developed during the hydratation reaction, by regulating the microstructure as far as the shape of the crystals is concerned. The effect of GO on the brittle behaviour of a Portland limestone cement paste is here examined. Firstly, GO is synthesised from natural graphite by using the modified Hummers’ method [1] which consists of three steps: oxidation, purification, and exfoliation. Then, by employing specimens reinforced with 0.03% in weight of the above GO sheets, flexural tests are performed according to the UNI EN 196-1 standard [2], and fracture toughness is measured applying a novel method, recently proposed by some of the present authors [3,4], that takes into account the influence of the main crack kinking on the fracture toughness value. The results are compared with those obtained from plain cement paste specimens.

**REFERENCES**

[1] Marcano D.C., Kosynkin D.V., Berlin J.M., Sinitskii A., Sun Z., Slesarev A., Alemany L.B., Lu W. Tour J.M., *Improved Synthesis of Graphene Oxide*. ACS Nano 2010; 4(8): 4806–4814.

[2] UNI EN 196-1, *Metodi di prova dei cementi - Parte 1: Determinazione delle resistenze meccaniche*, 2016.

[3] Carpinteri A., Fortese G., Ronchei C., Scorza D., Vantadori S., *Mode I fracture toughness of fibre reinforced concrete*, Theoretical and Applied Fracture Mechanics 2017; 91: 66–75.

[4] Vantadori S., Carpinteri A., Guo L.-P., Ronchei C., Zanichelli A., *Synergy assessment of hybrid reinforcements in concrete*, Composites Part B: Engineering 2018; 147: 197–206.