

Accepted Manuscript

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PII: S0013-7944(17)30957-8

DOI: <https://doi.org/10.1016/j.engfracmech.2017.11.008>

Reference: EFM 5746

To appear in: *Engineering Fracture Mechanics*

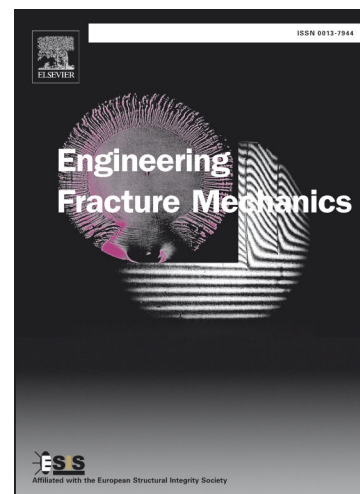
Received Date: 12 September 2017

Revised Date: 2 November 2017

Accepted Date: 3 November 2017

Please cite this article as: Torabi, A.R., Etesam, S., Sapora, A., Cornetti, P., Size effects on brittle fracture of Brazilian disk samples containing a circular hole, *Engineering Fracture Mechanics* (2017), doi: <https://doi.org/10.1016/j.engfracmech.2017.11.008>

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Size effects on brittle fracture of Brazilian disk samples containing a circular hole

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Abstract

Brittle fracture tests are carried out on Brazilian disk specimens containing a circular hole. The experimental campaign involves two different polymeric materials, Polymethyl-methacrylate (PMMA) and general-purpose Polystyrene (GPPS), respectively. Keeping fixed the disk diameter, five different hole sizes are tested for each material sample, thus allowing a full description of the related size effects. The recorded failure stresses are compared with theoretical predictions by the coupled Finite Fracture Mechanics criterion, which is originally implemented for the geometry under investigation by means of analytical relationships for the stress field and the stress intensity factor available in the Literature. The agreement is generally satisfactory, except from very small holes, where some nonlinear effects influenced the failure mechanisms.

Keywords: Brazilian disk tests, circular hole, brittle failure, size effects, Finite Fracture Mechanics.

List of symbols

K_I	=	stress intensity factor
K_{Ic}	=	fracture toughness
l_{ch}	=	$(K_{Ic}/\sigma_u)^2$, Irwin's length
P_f	=	failure load
R	=	hole radius
R_0	=	disk radius
t	=	disk thickness
Δ_c	=	critical crack advance

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