Accepted Manuscript

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PII: S0167-8442(17)30254-9
DOI: http://dx.doi.org/10.1016/j.tafmec.2017.06.004
Reference: TAFMEC 1886

To appear in: *Theoretical and Applied Fracture Mechanics*

Received Date: 14 May 2017
Revised Date: 6 June 2017
Accepted Date: 6 June 2017

Please cite this article as: Y.L. Liu, D.A. Cendón, P.W. Chen, K.D. Dai, Fracture of pbx notched specimens: experimental research and numerical prediction, *Theoretical and Applied Fracture Mechanics* (2017), doi: http://dx.doi.org/10.1016/j.tafmec.2017.06.004

FRACTURE OF PBX NOTCHED SPECIMENS: EXPERIMENTAL RESEARCH AND NUMERICAL PREDICTION

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ABSTRACT

Polymer-bonded explosives (PBXs) are being increasingly applied for both military and civil applications, especially when high performances are required. From a material structure point of view, they can be considered as a kind of composite material since they are made of a polymer matrix filled with a high content of explosive granules. They are intended for applications in which common explosives are not easily melted into the required final shape or are difficult to machine. For this reason, their use is normally associated to complex shapes with presence of corners and many different stress concentrators. Since unexpected failure and crack propagation in these materials may lead to malfunctioning and even to safety issues, the study of their fracture behaviour is of paramount importance.

In this paper the results of an experimental campaign on PBX semi-circular notched specimens subjected to mode-I bending are presented. In the tests different notch lengths were considered while the notch tip geometry was preserved. Besides this, the critical loads experimentally obtained were also evaluated through different criteria, such as the Embedded Cohesive Crack Model or the Theory of Critical Distances, in order to study the best approach to the fracture assessment of notched components made PBX.

KEYWORDS: PBX, Cohesive Crack Model, Theory of Critical Distances.

Nomenclature

a	Notch length
D	Diameter
B	Thickness
P_Q	Critical failure load
P_{max}	Maximum load
σ_{max}	Maximum stress