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Study of the resistance to crack propagation in thermal insulation materials

Abstract: Alumina presents a crack growth resistance that translates stable crack propagation before the fracture. The material toughness is not constant but increases with the crack extension. It depends on the crack extension Δa from an initial crack size a . This study was carried out by hertzian indentation and acoustic emission. The hertzian indentation consists to load specimen surface using a spherical indenter. Critical load P_c is determined by the highest acoustic emission peak. The loads below P_c provoke weak acoustic emissions translating a sub-critical crack propagation correlated to the resistance to crack propagation. Such materials can be used for the economy of energy in many areas for their thermal and electrical isolation character.

Keywords: Resistance to Crack Propagation, Hertzian Indentation, Acoustic Emission.

Results

The used monotonous loading leads to the progressively growth of circular cracks until the formation of a complete circle. Fig 1: The result of loading followed by an unloading, and the recorded acoustic emission. The circle occurred at the fracture critical load $P_c = 900$ N identified by the peak of the highest amplitude. The loads below P_c provoke weak acoustic emissions translating a sub-critical crack propagation correlated to the resistance to crack propagation. Fig2: The arcs numbering rate decreases first. Every time interval contains less acoustic events than the previous interval and it translates a resistance to cracks propagation.

Choix de session parallèle

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