Study of the resistance to crack propagation inthermal insulationmaterials

SeddikBOURAS,FaridGHELDANE

Laboratory of Advanced Materials,University of Annaba, B.P. 12, 23000 Annaba, Algeria
Corresponding author:bourasseddik@gmail.com

Abstract: Alumina presents a crack growth resistance that translates stable crack propagation before the fracture. In this case, 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. Thehertzian 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:, R-curve, Resistance to Crack Propagation, Hertzian Indentation, Acoustic Emission.

Results

In hertzian indentation tests, the used monotonous loading leads to the progressivelygrowth of circular cracks until the formation of a complete circle. Figure1 shows the result of loading followed by an unloading, and the recordedacoustic emission. The complete circle occurred at the fracture critical load P_c = 900 Nidentified by the peak of the highest amplitude. The loads below P_c provoke weak acoustic emissions translating a sub-critical crack propagation correlatedto the resistance to crack propagation.Figure 2 shows that the arks numbering rate decreases first. That means that every time interval contains less acoustic events than the previous interval and it translates a resistance to cracks propagation. Close to the critical load, very fast growth of the arks numbering rate is obtained.

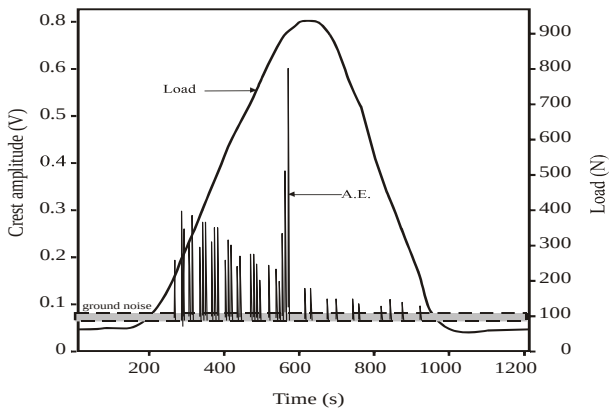

Figure 1 Acoustic emission and loading.

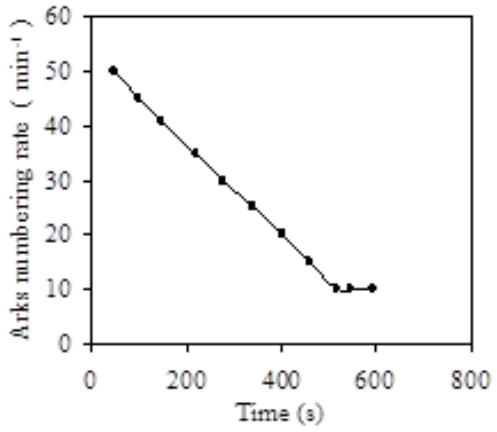

Figure 2 Arks numbering rate.