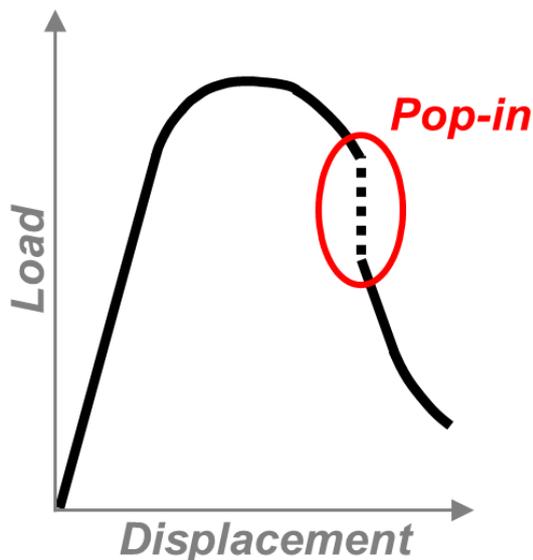


Understanding and modeling of fracture toughness tests with pop-in: application to 6061-T6 aluminum and neutron irradiation influence

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- The decrease of tearing modulus causes appearance of pop-ins.
- The decrease of system stiffness causes appearance of pop-ins.
- An instability criterion using J-integral is established.
- A dedicated device to change machine stiffness is set in place.
- Interaction between tearing modulus and system stiffness causes instabilities.

Abstract:

This study investigates the so-called “pop-in” phenomenon, i.e. unstable but limited crack propagation associated with a sudden decrease in load. Its origin is linked to an interaction between material tearing modulus and machine stiffness. A small scale yielding criterion from the literature is applied to compact tension (CT) samples. To validate this criterion experimentally, firstly tests are performed on aluminum alloy with various tearing moduli. Secondly the effect of mechanical loading on pop-in behavior is studied by varying machine stiffness using an innovative setup to vary system compliance. Pop-ins are shown to be mechanical instabilities due to interaction between material tearing modulus and system stiffness.