

1 Griffith paper

The first exercise in this series aims to analyse and understand one of the fundamental papers in fracture mechanics, Griffith's 1921 paper 'The Phenomena of Rupture and Flow in Solids'. The original paper is available by following this link, however, we will focus on an analysis of this paper by Professor Zhigang Suo (Harvard).

Please read the paper by Professor Suo, and answer the following questions. A discussion will be held in class during the exercises session.

1. What was the main problem that A.A. Griffith aimed to address in his 1921 paper on fracture mechanics?
2. How does Griffith's theory explain why materials like glass break at stresses much lower than their theoretical cohesive strength?
3. What role does the concept of pre-existing cracks play in the Griffith theory of fracture?
4. What is the significance of surface energy in Griffith's approach to fracture mechanics?
5. How does surface energy differ between solids, liquids, and polymers, according to the document?
6. How does Griffith's energy balance determine whether a crack will grow or heal?
7. How did Griffith experimentally verify his theory, and what were his key findings?
8. What was the major error Griffith made in his calculations, and how did it affect his results?
9. How does Griffith's work compare to Inglis's earlier work on stress concentration around elliptical holes?
10. What practical applications or modern engineering fields have been influenced by Griffith's fracture mechanics theory?