

FAILURE BY CRACKING

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Entrainment defects from the casting process are inherited by the solidified metal, leading to defects which are the source of the universal crack initiators, the Griffith cracks in metals. Examination of existing and accepted crack initiating mechanisms finds them all wanting; none currently appear to explain crack formation and propagation. It follows that the inherited casting defects may be the only source of failure. The elimination of these defects, which appears to be possible, should therefore lead to the elimination of cracking in metals. Evidence is accruing to indicate the truth of this prediction. The consequent elimination of the common failure processes such as fatigue, creep, stress corrosion cracking, etc. all appear possible. For aerospace, an enhanced electroslog (ESR) process for steels and Ni alloys is recommended but vacuum arc remelting (VAR) is not, it appears to be fundamentally flawed and unsuitable for safety critical applications.

Biography

John Campbell is a Physicist from Cambridge, Sheffield and Birmingham Universities. His interest is in the Liquid and Solid States during Metal Manufacture. He has worked in industry, developing casting processes, building and running casting operations for much of his life. As a Prof of Casting Technology at the University of Birmingham, he is responsible for the bifilm concept, and the development of the naturally pressurised filling system design for castings. He is the author of too many papers and patents and several books: his 'Complete Casting Handbook' is not for the faint-hearted. He is an indefatigable promoter for the manufacture of defect-free cast products.

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