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ANALYZING THE FRACTAL OF THE FRACTURE OF WELDING JOINT IN AEROSPACE INDUSTRY TO EVALUATE THE FRACTURE TOUGHNESS

Abstract

In this paper, a new method by analyzing the fractal to evaluate the fracture toughness of welding joint has been studied. In researches before, fractal geometry has been extensively applied to characterize the roughness of fracture surfaces and to correlate it with material mechanical properties. In our study, relationship between fractal of welding joint fracture and fracture toughness has been researched. Three widely used welding methods in aerospace industry-VPPA, EBW, and FSW-had been used to farbricate butt joints. Tensile tests had been carried out at room temperature and -196 C. The aera of tensile curve was also calculated to represent the fracture toughness of different joints. The fracture surface of joints was analyzed through. Computer vision and 3D reconstruction has been applied to reconstruct fracture surface. Fractal of fracture surface was calculated with the cubic covering method from the reconstructed surface. The relationship between fractal and fracture toughness was discussed, and the results could be used to evaluate the reliability of welding joints in aerospace industry.