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Response to fatigue stress of biomedical grade polyethylene joints welded by a diode laser

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Abstract

Biomedical grade UHMWPE double lap joint, welded by a diode laser, has been mechanically characterized by static and dynamic tests. A nanocomposite sheet (UHMWPE filled with low carbon nanoparticles amount) was interposed between two polymeric sheets in order to absorb the laser light, sealing the sheets by means of a melting process. Fatigue test has been performed in the joint with 0.016 weight% of carbon nanofiller for its best mechanical static resistance among those studied. Its fatigue limits resulted to be equal to 22000 cycles. Breaks occurred at the 2nd welded interface, where a poor melting process weakens the entire joint.

Key words: UHMWPE; polymeric joints; laser welding; lap shear test; fatigue limit.

1. INTRODUCTION

As regards polymeric and composite joints, in the last 40 years their mechanical characteristics have been studied by scientific literature. In particular, dynamic analysis is extremely relevant during

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