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Micro perspective on anti-fatigue performance enhancement of PFC metal welding interface with MD simulation

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As one of key technical specification, the anti-fatigue performance of plasma-facing components (PFC) in fusion reactor receives widely concerns. Many researchs concluded that the micro structure on PFC metal connecting interface greatly affects its fatigue performance of interface, especially for some micro/nano scale pories in connection zone, which are difficult to be detected by ordinanry techniques and easy to be negleced. In this paper, a method of utilizing impacting stress wave to elimiate internal nano pories on welding interface of PFC component is proposed. To examine the feasibility and results of this method, moleculer dynamics models are established. Then the healing process of a half sphere nano cavity under the impacting of different stress wave at different temperture conditions are computed and observed. To remedy the dislocation of grain after impacting stress wave, a kind of post heat treatment process is simulated based on different nano cavity-healed results at different conditions. Finally, the fatigue strengths of different cases are compared. The results show a prominent increase of fatigue strength for case treated by proposed method.

Eligible for student paper award?

Yes

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