Electrochemical Dissolution Behavior of Ti-48Al-2Nb-2Cr in NaNO₃ and NaCl Electrolytes

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Ti-48Al-2Nb-2Cr (TiAl4822) intermetallic material is an excellent lightweight and high-temperature alloy used in the aerospace industry. Electrochemical machining (ECM) is one of the most significant processing technologies for the manufacturing of TiAl intermetallics. A comprehensive understanding of the electrochemical dissolution behavior of TiAl4822 alloys is critical for the optimization of electrolyte composition and processing parameters. This study investigates the electrochemical dissolution behavior of TiAl4822 to improve machining efficiency and surface quality obtained by ECM. Polarization and current efficiency curves of TiAl4822 in NaNO₃ and NaCl electrolytes at different temperatures and concentrations were analyzed. To compare electrochemical dissolution behavior in two electrolytes, we performed single-factor experiments by varying one of the following parameters in a single experiment: applied voltage, duty ratio, frequency, electrode feed rate, and electrolyte temperature. The experimental results show that TiAl4822 has a higher material removal rate in NaCl and a higher surface quality in NaNO₃.

Keywords: Ti-48Al-2Nb-2Cr, Electrochemical machining, Electrochemical dissolution behavior, polarization curve, single-factor experiment

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