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Effect of aluminium and chromium powder mixed dielectric fluid on electrical discharge machining effectiveness

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ABSTRACT

This article studied the impacts of using different powders on the productivity of electro discharge machining (EDM) of Nimonic 80A alloy. The powders used for experiments are chromium (Cr) and aluminium (Al), though these powders are in contrasts in their thermo-physical characteristics. With the mixing of these powders in dielectric fluid, effect on surface roughness (*SR*), material removal rate (*MRR*), and mechanism of the machining process have been studied in this research work. On going through the results of experiments, it was observed that even volumetric proportion of powders, size of molecules, its density, electric resistance, and heat conductivity of additives were vital parameters that altogether influenced the productivity of powder mixed-electro discharge machining (PMEDM) process. With addition of proper ratio of powders in dielectric fluid, it enhanced the material removal rate, and consequently, reduced the surface roughness. Under a similar molecule volumetric proportion tests, the minutes suspended molecule size of powder prompted the largest material removal rate and consequently, the surface roughness increased. Conclusion is that adding chromium powder improves to the highest material removal rate, but poor surface finish while adding aluminium powder has the reverse effects.

ARTICLE INFO

Keywords:
Powder mixed-electro discharge machining (PMEDM);
Aluminium powder;
Chromium powder;
Dielectric fluid;
Productivity;
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Izvirni znanstveni članek

Vpliv dielektrične tekočine z dodatkom aluminija in kroma v prahu na učinkovitost obdelave z elektroerozijo

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POVZETEK

Članek obravnava vplive uporabe različnih praškov na obdelovalnost zlitine Nimonic 80A z elektroerozijo (EDM). Za poskuse sta uporabljena krom (Cr) in aluminij (Al) v prahu, čeprav sta v svojih termičnih in fizikalnih lastnostih različna. Z dodajanjem teh praškov v dielektrično tekočino smo v tem raziskovalnem delu preučili vpliv na površinsko hrapavost (SR), hitrost odstranjevanja materiala (MRR) in mehanizem obdelave. S pregledom rezultatov smo ugotovili, da so celo volumetrični deleži praškov, velikost molekul, gostota, električni upor in toplotna prevodnost dodatkov izjemno pomembni parametri, ki skupaj vplivajo na produktivnost obdelave z elektroerozijo s suspenzijskimi praški (PMEDM). Z ustreznim razmerjem prahu v dielektrični tekočini se je povečala hitrost odstranjevanja materiala in posledično zmanjšala hrapavost površine. V poskusih s podobnimi volumetričnimi deleži molekul je minutna suspenzijska velikost molekule v prahu spodbudila največjo hitrost odstranjevanja materiala, posledično pa se je hrapavost površine povečala. Zaključek je, da dodajanje kroma v prahu poviša stopnjo odstranjevanja materiala, vendar ima slab učinek na kakovost površine, medtem ko ima dodajanje aluminija v prahu obratne učinke.

PODATKI O ČLANKU

Ključne besede:
Elektroerozija s suspenzijskimi praški (PMEDM);
Aluminij v prahu;
Krom v prahu;
Dielektrična tekočina;
Produktivnost;
Hitrost odstranjevanja materiala (MRR);
Hrapavost površine;
Nimonic 80A zlitina

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