Generation of Lubricant Layer by Electrical Discharge Machining with Powder Suspended in Working Fluid

Background and problems

- Demands for lubricant on joints of space machines
- Restriction of Size and shape in spattering
- Deformations of parts caused by heat

Solution

- Electrical discharge machining (EDM) with solid lubricant powder (MoS_2) suspended in working fluid

Advantages

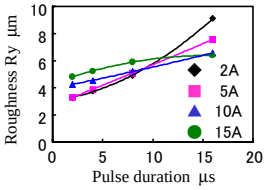
- Deposition of lubricant during finishing
- Dispersion of lubricant into workpiece

Results

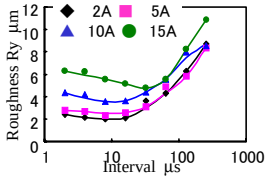
- Surface roughness below 2μmRy by using mixture of MoS_2 and aluminum powder
- Finished surface with lower friction coefficient than that by normal EDM
- Smaller amount of cracks

Applicable fields

- Space robots and machines
- Press molds

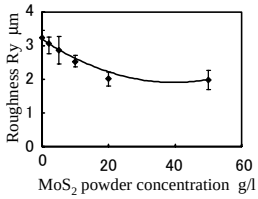


Roughness vs. pulse duration

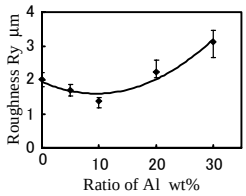


Roughness vs. interval

Influence of electrical conditions

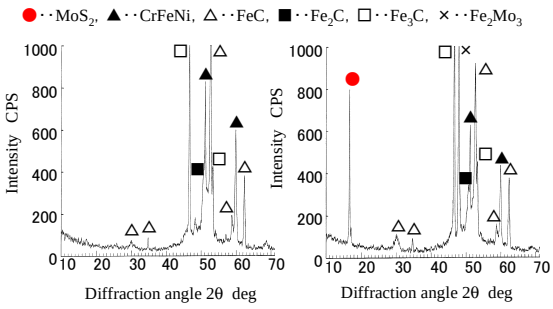


Roughness vs. MoS_2 concentration



Roughness vs. ratio of Al

Influence of powder concentration

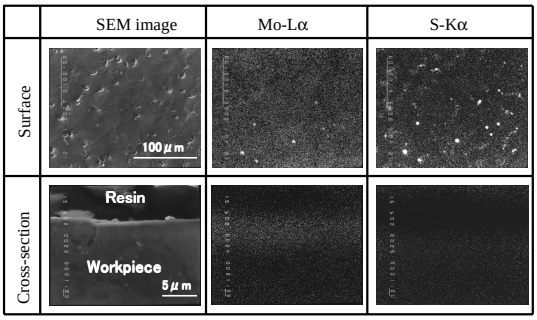


Without MoS_2 powder *With MoS_2 powder*

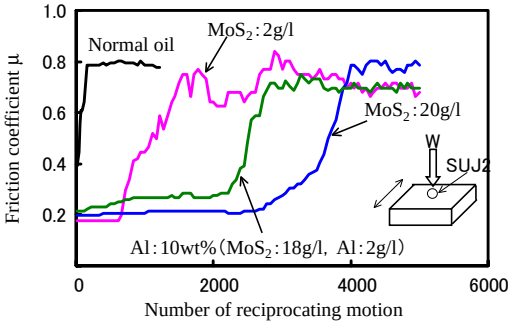
Result of X-ray diffraction

Electrical conditions for deposition of MoS2 during finishing EDM

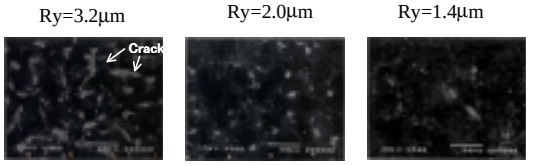
Polarity	(-)
Gap open voltage	320 V
Discharge current	2 A
Pulse duration	2 μs
Interval	8 μs



Result of EPMA analysis



Results of friction test



MoS_2 powder 20g/l

MoS_2:Al=90:10wt% (MoS_2=18g/l, Al=2g/l)

Without powder *With powder*

Appearance of machined surface

URL: http://www.toyota-ti.ac.jp/Lab/Kikai/5k60/

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