

FRICIONAL PROPERTY WITH 3D CAPILLARY STRUCTURED SURFACE BY SELECTIVE LASER MELTING

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KEYWORDS

capillary phenomenon; selective laser melting; seizure

ABSTRACT

In order to improve friction characteristic of sliding surface, it is important to prevent oil starvation. Surface texturing is one of the method to improve friction properties by maintaining lubricant on sliding surface [1]. However, effect of conventional surface texturing has limit to prevent oil starvation under severe condition [2]. In order to improve friction properties, self-oil circulating structure called the 3D capillary structure as shown in Fig. 1 was proposed. The 3D capillary structure can collect excessive lubricant from sliding surface and supply it again into sliding interface by utilizing capillary phenomenon. The 3D capillary structure was manufactured by selective laser melting, because of its complex microstructure.

The 3D capillary structure specimen was made from AISI S17400 powder by a metal 3D printer (ProX 300, 3D Systems USA). In this report, oil circulating function and sliding properties of the 3D capillary structure were investigated. To

confirm oil circulating function, sliding test was observed by a video camera. Sliding tests were conducted by cylinder-on-plate type SRV4 sliding tester. The cylinder ($\phi 6 \text{ mm} \times 18 \text{ mm}$) was made of AISI 52100. In this experiment, non-textured and conventional dimpled specimen's as shown in Fig. 2 anti-seizure property of the 3D capillary structure was assessed by comparing.

Experimented results showed that the 3D capillary structure exhibits oil circulating function and improves anti-seizure properties. It is suggested that the 3D capillary structure has a potential to improve anti-seizure property.

REFERENCES

- [1] H. Yamakiri, et al.: "Laser surface texturing of silicon nitride under lubrication with water", Tribology International, 44, 5579-584 (2011)
- [2] Y. Kuroiwa et al.: "Effectiveness of surface texturing for improving the anti-seizure property of copper alloy", Procedia Engineering, 68, 600-606(2013)

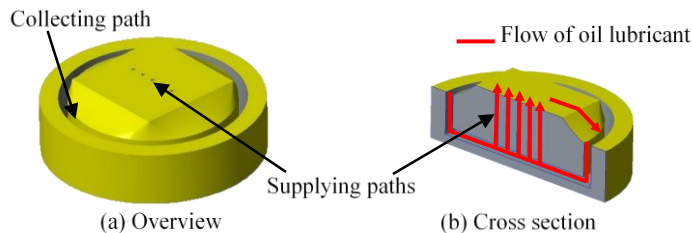


Fig. 1 Schematic diagram of the specimen with the 3D capillary structure

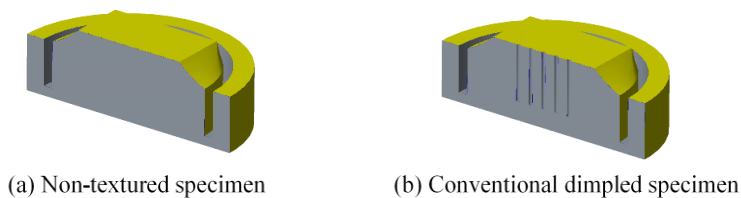


Fig. 2 Schematic diagram of test specimens

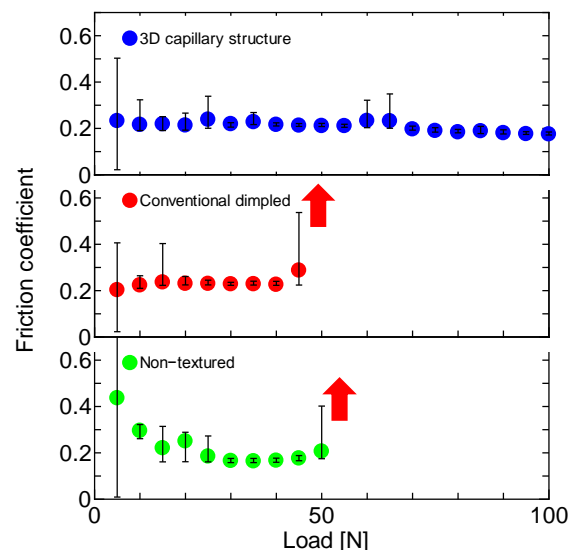


Fig. 3 Frictional behavior of textured specimens