

エレクトロスピニングを用いた液体滑液膜の作製と評価

Fabrication and evaluation of slippery liquid-infused porous surface

by electrospinning method

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In nature, many plants and animals show various wettability. Generally, special wettability is caused by both surface chemistry and surface structure. In regard to surface structure, micro-nano-sized hierarchical structure increases the contact angle of droplet, which makes them not adhere but roll off. Therefore, superhydrophobic surface, which can repel water, is expected to antifouling coatings for various fields. Recently slippery-liquid-infused-porous-surface, which has extremely repellent property, was reported ^[1]. With this surface, we can repel low surface tension droplet at much low sliding angle, which was unable for past hydrophobic surfaces. For application, simple, cost-effective and scalable method for fabricating this surface is desired.

In this study, we fabricated thin film with PVDF-HFP polymer, which have hydrophobicity, chemical inertness, high thermal stability, and mechanical strength ^[2,3]. We used electrospinning method, which is simple, cost-effective, and scalable. We controlled the fiber diameter by varying the composition ratio of the solution and investigated the relation between structure of underlying film with sliding property. In addition, droplet behavior in case of underlying film having special structure was also investigated. Applied films with a unique sliding performance and optical performance is expected to apply for the surface of solar cell.

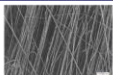
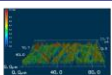
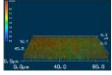
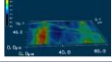
Cycle speed	Amount of lubricant	Laser microscope image	3D image	RMS
0 rpm	72.5 $\mu\text{g}/\text{mm}^2$			1.983 μm
1000 rpm	16.7 $\mu\text{g}/\text{mm}^2$			0.158 μm
2000 rpm	12.6 $\mu\text{g}/\text{mm}^2$			0.378 μm
4000 rpm	7.0 $\mu\text{g}/\text{mm}^2$			1.651 μm

Figure.1 Surface roughness of Laser microscope images and physical data of fabricated films

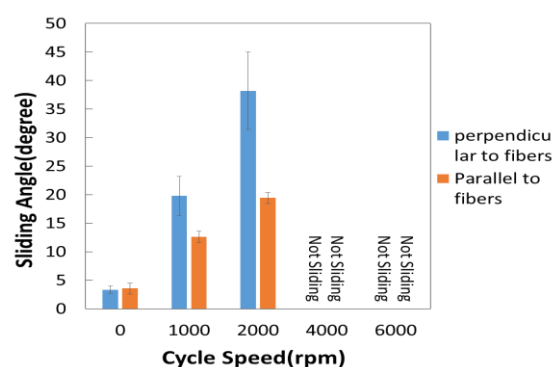


Figure.2 Relationship between sliding angle and cycle speed of spin coating

References

- [1] Tak-Sing Wong et al., Nature.2011, 477, 443.
- [2] Lalia, BS et al., LANGMUIR.2013, 29, 13081
- [3] Issei Okada and Seimei Shiratori, ACS Applied Materials & Interface, 6, 1502, 2014