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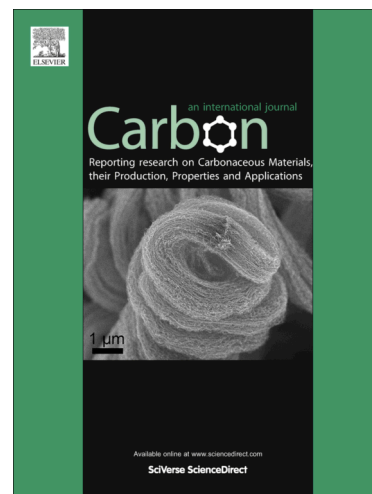
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**Understanding the ultra-low friction behavior of hydrogenated fullerene-like
films grown with different flow rate of hydrogen gas**

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Abstract:

Fullerene-like hydrogenated carbon (FL-C:H) films that exhibit ultra-low friction and wear in humid conditions have been the subject of extensive researches, but the structure-performance relationship such as the evolution of FL structures under friction is not well understood. We have prepared FL-C:H films with different FL content, and have addressed a detailed investigation on the relationship. It is found that with the increase in FL content, the friction and wear of FL-C:H films can reach as low as 0.011 and $1.48 \times 10^{-8} \text{ mm}^3/\text{Nm}$. Examination of the corresponding wear tracks by Raman spectroscopy reveals that not graphitization but friction-induced promotion of FL structures causes the ultra-low friction and wear of FL-C:H films. We therefore claim that FL structures are in close positive relations with the excellent tribological performance of FL-C:H films.

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