

# Structure and Tribology of C<sub>60</sub> Buckyballs

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Owing to a soccerball shape and to a high rotational speed of 10<sup>9</sup> rps, Buckminsterfullerene C<sub>60</sub> (Buckyball) has been expected as an excellent ball bearing which may solve tribological problems of microcomponents. However, experimental data on friction of C<sub>60</sub> by Sasaki and by Bhushan and co-workers did not show a satisfactorily small friction as had been expected. One of the possible reasons for this is that the deposited C<sub>60</sub> did not perform like a soccerball due either to film preparation or to excessively high loads in friction testing.

We started our studies on C<sub>60</sub> by actually observing the atomic structure of C<sub>60</sub> with a field ion microscope (FIM) and a scanning tunneling microscope (STM). The structure of C<sub>60</sub>, printed in the Asahi newspaper, is showed in Figure1, where the identified hexagons and pentagons are indicated by graphic overlays. The imaging of C<sub>60</sub> by FIM at a liq. N<sub>2</sub> temperature may stop the rotation, thus giving a good photo, whereas STM did not provide an atomically resolved C<sub>60</sub> structure.

Since the modification of surface by C<sub>60</sub> is essential, especially for micromachines, we have started the MBE of C<sub>60</sub> inside FIM in which a Knudsen-cell for C<sub>60</sub> and a RHEED (Reflection High Energy Electron Diffraction) are newly equipped. We currently expedite experimental works to use C<sub>60</sub> Buckyballs as "super lubricant".

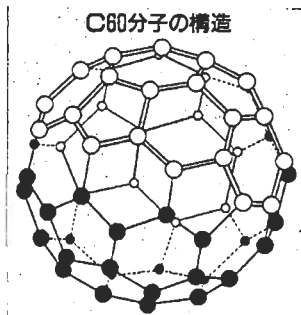
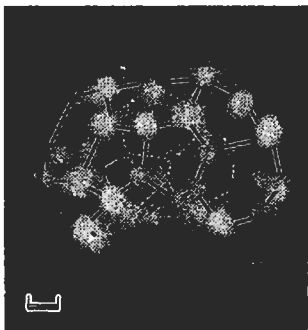


Figure1 Atomically-resolved Buckyball

## references

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