



Ohtake Lab

Fabrication and Application of Diamond-Like Carbon

Materials Processing Science Research Core
Laboratory for Future Interdisciplinary Research of
Science and Technology (FIRST)

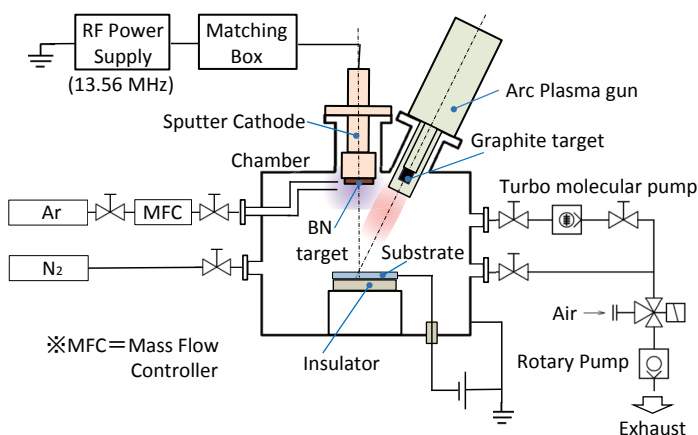
<http://www.first.iir.titech.ac.jp/english/member/core6.html>



- Fabrication and tribological application of Diamond-Like Carbon (DLC) films.
- Thin films fabrication by novel vapor deposition method including nano pulse plasma CVD, hybrid plasma CVD .
- Systematization of adamant thin films.

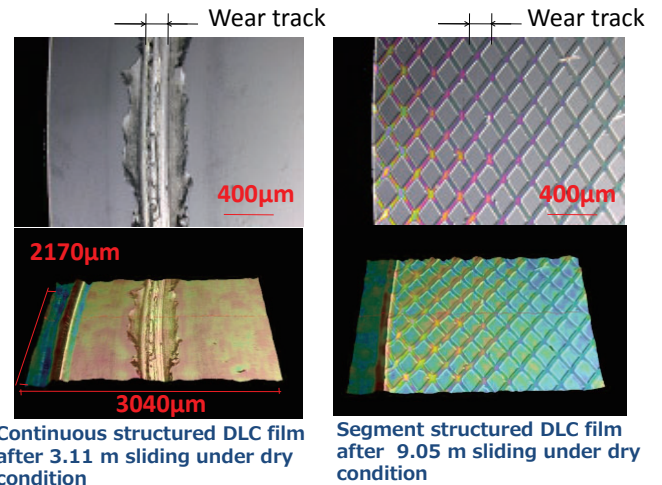
DLC has excellent properties such as high hardness, low friction coefficient and chemical stability, which are similar to diamond's properties. We are aiming for further promotion of DLC coating technology.

- ★ To develop deposition method of abrasion resistant texture DLC film and B-C-N system adamant film, then evaluate the mechanical or tribological properties.
- ★ To design the surface that can protect mechanical parts even under severe moving conditions where contamination such as dust is mixed in lubricating oil.
- ★ To enhance the chemical resistance and biocompatibility of DLC by adding third element other than C and H atom. By applying this technique, we tried to develop the DLC coated medical devices which is required high biocompatibility.
- ★ To develop a DLC based coating technique that can be easily peeled off against any resin or adhesive.



DLC coating techniques

- It is possible to deposit DLC film and BN film simultaneously by using arc plasma gun and magnetron sputtering respectively. It also enable us to fabricate the h-BN film.
- To develop DLC based coating technique which can be easily peeled off against any resin against adhesive by lamination of DLC and BN film.
- By using various coating method such as filtered cathodic vacuum arc (FCVA) apparatus, nanopulse plasma CVD apparatus, DLC films were fabricated. We are challenging to coat DLC film on the inner surface of a circular tube at sub-atmospheric pressure.



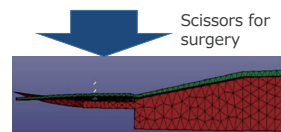
Fine surface structure (segment structured) DLC film

- The micron-ordered segment structure is clearly observed on the surface of right figure.
- The effect of the segment structuring is remarkable in the ball on disc test under dry conditions. The continuous structured DLC has been completely peeled off and worn out at 3.11 m sliding distance. On the other hand, wear track cannot be seen on the surface of segment structured DLC even after 9.05 m sliding.

Scissors for haircutting *Seek*

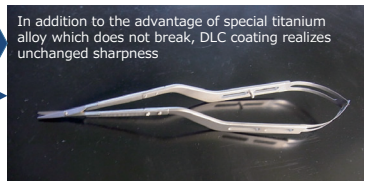


Achievements of scissors development

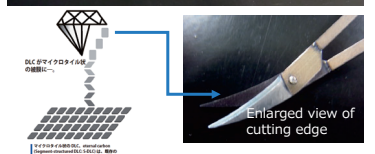


Scissors for surgery

Scissors for surgery (Ti-Nb/S-DLC)



In addition to the advantage of special titanium alloy which does not break, DLC coating realizes unchanged sharpness



Application of DLC to Scissors

By applying the segment structured DLC, we developed a scissors for haircutting that is excellent in sharpness and high durability, and put into practical use in support of the Tokyo Tech start-up. Furthermore, we developed scissors for brain surgery also using the same technology.