

# Study of In-Liquid Synthesis of Diamond

Technical development aimed for chemical change/cut/precipitation and self-assembly/aggregation

Takeshi Tanaka<sup>a</sup>

<sup>a</sup>Research Organization of Science and Engineering, Ritsumeikan University

E-mail: ttakeshi@se.ritsumei.ac.jp

## 1. Introduction

The investigated test results are described for establishing the new technology of diamond thin film synthesis that coexists with the traditional manufacturing methods of HPHT, CVD and Detonation. The most important subjects of this paper are to form diamond thin film, to verify the synthesis phenomena and to clarify the success of in-liquid synthesized diamond for recognizing a synthesis establishment<sup>1</sup>.

## 2. Construction and hypothesis concept of synthesis principle

The active carbon species and organic compounds are generated in an organic sol by the chemical change. The cut of these substances using an ultraviolet lead to generate the free carbons (atomic carbons of  $sp^2$  and  $sp^3$ ) in the organic sol. The self-assembly precipitates amorphous from monomer. The aggregation forms diamond on the substrate where these amorphous and monomer precipitate.

## 3. Experimental procedures

Figure 1 shows the schematic diagram of synthesis method. It appears that the combined bridges of most organic polymers are cut by irradiating an ultraviolet bellow about 400 nm wave length. We use the reaction vessel that made from quart glass, or the combinations of soda glass and polypropylene resin. The closed reaction vessel respectively leaves the one bottle that contains Liquid A, and the other bottle that contains Liquid B or Liquid D.

## 4. Results and discussion

Figure 2 shows XAFS result of the synthesis that carried using PCD. Pre-synthesis substrate (Origin PCD) clearly has an intensity valley at around 302 eV, but not a spectrum at around 350 eV. Three kinds of PCD that synthesized under each condition have an intensity valley at around 302 eV and a spectrum at around 350 eV. In other words, it appears that the film formed over PCD is diamond which a little contains organic polymer included with Ca. On the other hand, pre-synthesis substrate (Origin PCD) clearly had a spectrum of Co, since PCD is sintered using Co. However, three kinds of PCD that synthesized under each condition have not a spectrum of Co. The synthesized film is different from the substrate of origin PCD.

## 5. Conclusions

Acetone/KOH aqueous solution resolve/hydrolyze a polystyrene and a gelatin/cocoon/rice. Chemical change between them leads to make organic sol black, and generates active carbon species and organic compounds. Diamond is synthesized on PCD and natural diamond by self-assembly/aggregation of carbons. Acknowledgements

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## Reference

- 1) T. Tanaka, *J of JSPE*, **2023**, 89, 1, 113.

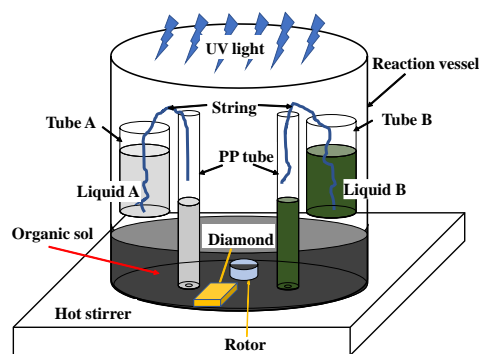


Fig.1 Schematic diagram of in-liquid synthesis method

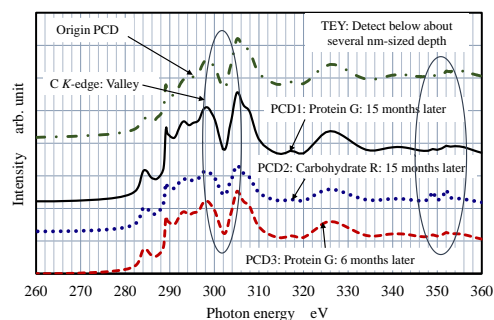


Fig.2 XAFS TEY analysis of thin film formed in liquid