

## Japan-Russia Workshop on Advanced Materials Synthesis Process and Nanostructure

Function and structure of materials strongly depend on their synthesis route. A new processing technique enables us to produce a novel material with a unique nanostructure. A precursor material also affects on the property and structure of products. This international workshop will focus on materials processing and precursor design for advanced materials synthesis.

Chemical vapor deposition (CVD) has been widely used for preparing films. CVD bulky plates, mainly non-oxides (nitrides and carbides) such as CVD-SiC wafer, have been prepared by CVD. Although oxides have useful applications for electronics, optics and protective coatings, CVD oxide thick films have hardly been obtained.

We have developed a new kind of laser CVD enabling high-speed and wide-area deposition by using high-power lasers [1]. The deposition rate of our laser CVD is several orders higher than those of conventional CVD. In addition, laser CVD films often had a unique nanostructure.

By using laser CVD, we have prepared various oxides and non-oxides films: thermal barrier coating of  $Y_2O_3$ - $ZrO_2$  film with a feather-like structure containing a large amount of nano-sized pores which decreases the thermal conductivity [1], high-speed deposition of  $27500 \mu\text{m h}^{-1}$  for  $SiO_2$  coating [2], SiC- $SiO_2$  nanocomposite [3], highly c-axis oriented growth of  $\alpha$ - $Al_2O_3$  film [4], a non-lead ferroelectric  $BaTi_2O_5$  film [5] and  $YBa_2Cu_3O_{7-\delta}$  superconducting film [6].

Nikolaev Institute of Inorganic Chemistry, Siberian Branch of Russian Academy of Sciences (NIIC SB RAS) has the advantages of producing novel and unique precursors for CVD process, such as for Si-N-C-N and B-C-N system. Methodology developed in NIIC SB RAS demonstrates preparations of CVD films for nanoscale electronic devices.

Tohoku University and SB RAS have a sufficient cooperative structure in many fields for a long time. Particularly, IMR and NIIC SB RAS both have strong potential in field of development of CVD processing. This collaboration will covers all steps of development of a novel CVD process: design and selection of new CVD precursor, establishment of their synthesis processes, thermodynamic modeling of CVD process, development of a new CVD utilizing auxiliary energy source, CVD coating at a wide range of conditions and characterization of processing-structure-properties relations.

Japan-Russia CVD seminar puts together researchers exchange ideas on cutting edge of CVD technology, and thus it is suitable for gain deep knowledge on advanced materials synthesis process. Joint workshop with excellent graduate schools in Tohoku University will encourage young researchers in Tohoku University, IMR and NIIC RAS through international interaction.

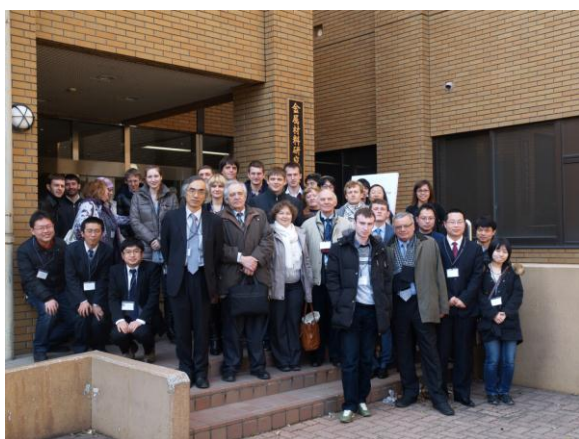


Fig. 1 A group photo at Japan-Russia CVD seminar held at IMR, Tohoku University.

### References

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