these new processes have their own merits and devrerito compared with conventional other processings. Some countermeasures must be necessary to improve their potential.
My question is what should we do in order to improve these new technologies for applying to pratical use in production. Please point out one or two important points which we should consider and solve for improvement of each process Dr. Wehr has classified.

Answer (*Dr. M. Wehr*) :
As far as I know, some of the processes I have described are already in development, and will be on production line (in less than 2 years) in a near future, but nor is the field of ceramics coating (it means that there is no more problems for certain of these processes, in some companies). It is the use of the stellite coating of turbine blades by powder injection processes assisted by laser, process which is already in development. It is also the case of deposition of metal by laser CVD for mask depositing, and this process is already sold on the market.

"Formation of High Function Ceramic Surface by Ion Implantation"

Prof. N. Iwamoto

Question (*Dr. Iwaki*) :
I am much interested in your work, and I think you suggest the possibility that a certain ceramics transforms other types of ceramics by high fluence ion implantation.
I think that there are two big categolies in the fields of surface modification of ceamics by ion implantation; one is the metallization of the near surface layers of ceramics by metal ion implantation and the other is the transition of types of ceramics by high fluence ion implantation with light ions such as carbon, nitrogen and oxygen.
Your report is an example of the latter case, you introduces preliminary experimental results with microcharacteristics of nitrogen implanted SiC measured by means of RBS, XPS, SIMS and laser Raman. It seems that the results indicate the formation of nitrides, oxides, oxinitrides, carbonitrides, graphite and so on. We have investigated the surface layer modification of non-oxide ceramics such as AIN and SiC by metal ion implantation with a high fluence. We also found such similar results as the formation of graphite and oxides in SiC due to ion implantation.
In order to clarify the formation of compounds in nitrogen implanted SiC, I will ask you tnree questions.
1. It seems that the RBS spectra for nitrogen implanted SiC, that is the as-implanted SiC, indicate the enrichment of carbon near the surface layers. Is it true?
2. You explain that the XPS spectra for Si_{2p} indicate the occurrence of oxidation. Please show us the ratio of compositions for all of the elements in nitrogen implanted SiC and the XPS spectra for O_{1s}.

Lastly, are your experimental results desirable from the standpoint of improvement of physical, chemical and mechanical properties?

Answer (*Prof. N. Iwamoto*) :
1. As shown in Fig. (7), we can conclude that the decomposition of SiC, that is to say, to form free carbon and silicon occurs with nitrogen ion implantation at the surface of specimen. Also it is recognized that the higher the ion implantation is, the greater free carbon forms.
2. As shown in Figs 4(a), (b) and 5(a) and (b), it can be seen the formation of SiO_2 with after-heat-treatment of 1273°C x 1hr. (Si_{2p} value=103.5eV)
   In Fig. 4(a) and (b), the only formation of SiO_2 with the disappearance of Si_3N_4 can be determined. Of cource, in Fig. 4(a) and (b), the relation between the ratio of Si_3N_4/SiO_2 and the change of after-heat-treatment temperature is given so that the former can be calculated by using convolution method.
3. Though the author did not present in this publication the improved behaviors of the mechanical properties such as wear-resistance, hardness and fracture toughness with ion implantation in SiC, this technique is superior one for the improvement of physical, chemical and mechanical properties of every matter.

Concluding Remarks

Prof. H.D. Steffens and Prof. N. Iwamoto

In session II, the progress on the surface modification procedures have been treated.
At first, Professor Steffens of Dortmond University in West Germany presented the paper titled "Arc and Plasma Spraying Today and in the "90th". He emphasized that arc and thermal spraying technologies were becoming more and more important technique to give special properties such as high resistance to corrosion and wear to materials. The production of composite texture composed from austenitic steel fiber embedded into MCrAlY alloy phase with after-hot isostatic pressing was introduced. Following, he said that the application of vacuum plasma spraying for MCrAlY coating on turbine blade was important. However recent endeavours to apply this procedure to coat reactive materials such as titanium and tantalum have been paid. He presented new plasma spraying