Highly charged ion beam applied to lithography technique

Highly charged ion (HCI) beam is one of the promising tools in the field of nano-technology for fabrication and modification of materials. In order to develop ion beam lithography (IBL) technique further, HCI beam has been applied in our research group.
Caused by a small lateral straggling of ion beams in irradiated materials, the fabrication of sub-micron structures can be easily achieved by IBL technique. And the good controllability of a fabrication depth through ion beam energy is suited to fabricate 3-dimensional structures. Furthermore, it is expected that the application of HCI beam to IBL technique will make the technique more powerful. Firstly, HCI have good accelerative property. This property will lead to efficient fabrication of 3-D structures with high aspect ratio.
Secondly, HCI has higher reactivity with materials caused by stronger Coulomb interactions. In the fields of fundamental studies, various unique phenomena, such as enhancement of secondary electron emission from irradiated surface, have been observed. These phenomena will induce changes in a fabrication process of IBL.
We have tried to study these HCI effects in IBL technique by using ECR ion source, which can produce HCI beams with high intensity compared with other kinds of ion sources. Other industrial applications of HCI beams, nano-hardness and so on, will be also reported.

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