

## Machining of Brittle Materials

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Hard, brittle materials such as silicon, germanium are commonly used in infrared optics and semiconductor based products however, these materials cannot be traditional machined like turning and grinding, machining of ceramics is more of a crushing process rather than a metal cutting process. An advance in the precision engineering has led to the possibility and discovery of "*Ductile Regime Machining*" of brittle materials.

It is found that plastically deformed chips are formed in machining of brittle materials if the scale of machining operation is small (less than  $1\mu\text{m}$  depth of cut), ie... ductile mode cutting could be achieved. The main objective is to realize a damage free machined surface on brittle materials by diamond turning in ductile regime. Scratch and Indentation tests were carried out to study the brittle to ductile transition, establish critical depth of cut and to study the influence of machining parameters on the surface finish of machined surfaces and tool wear in nano machining of diamond turning of some selected brittle materials particularly silicon. Thus a deterministic manufacturing process (Single Point Diamond Turning) has to be used to achieve fine surface finish, dimensional and geometrical accuracies on parts made of brittle materials.