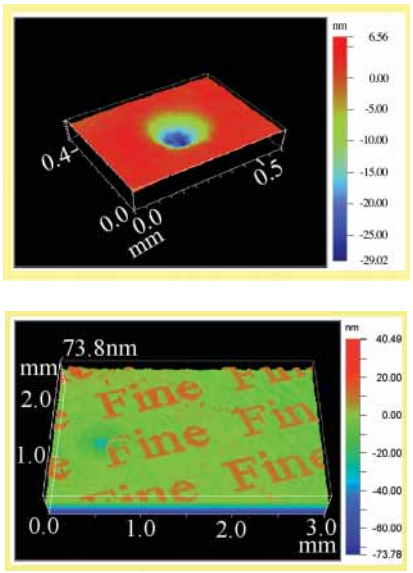
Precision Machining of Brittle Materials

Ichiro OGURA
Institute for Mechanical System Engineering
e-mail:
ogura.i@aist.go.jp
AIST Today Vol. 2, No. 5
(2002) 16

Ductile mode machining of brittle materials, such as optical glasses, enables high-precision optical devices without the use of a mold. This study presents experimental results on machining of optical glasses by using ultra-precision lathe. Machining experiments on glasses were conducted in several different atmospheres. Damage-free cutting mark can be obtained over 0.3-micrometer tool infeed in linoleic acid atmosphere. A profile generation experiment on brittle materials was performed. The micro-pit array and some characters were cut on the surface profiles without brittle damages. The maximum depth of the profile is almost 30 nm. A deeper form without brittle cracks will be obtained by carrying out repetitive cutting.

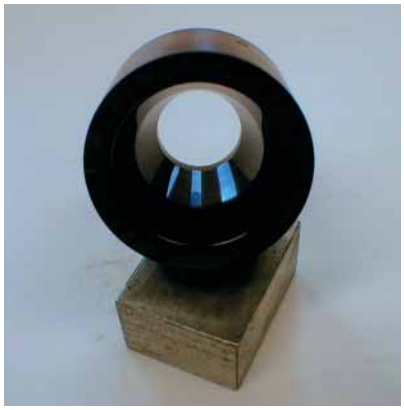


Typical cutting pattern over soda lime glass

New Polishing Method for CVD Diamond Film

Toshihiko ABE
Institute for Structural and Engineering Materials
e-mail:
toshihiko-abe@aist.go.jp
AIST Today Vol. 2, No. 5
(2002) 17

New polishing method for CVD diamond film by using a sintered intermetallic TiAlX wheel is developed. This method is utilizing a strong chemical reaction between titanium and carbon, chemical component of diamond. A tungsten carbide die of 45mm outer diameter, whose inside is coated by 10 micrometer thick CVD diamond film, can be mirror polished within 30 minutes in air and at room temperature using the TiAlX wheel rotating at 3000rpm. This polishing time is less than one tenth of the traditional polishing method.



Inside of this tungsten carbide die is coated by mirror polished CVD diamond film of about 10 micrometer thick