

Coated Silicon Mold for Miniature Glass Optics Production

用於生產微型玻璃光學件的矽塗層模具

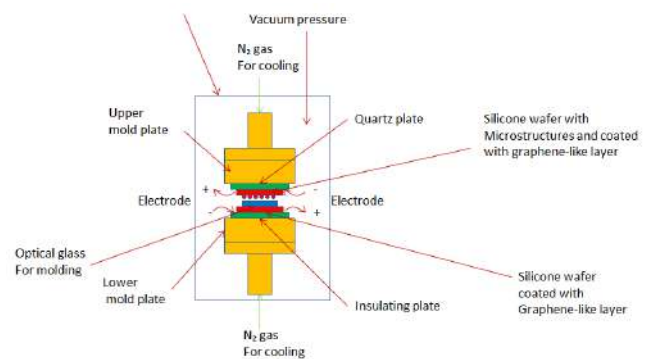
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Special features 技術特點

- ▶ Can replicate very fine optical microstructures with micron level accuracy and nanometric surface finish 可製造具有微米級精度和納米表面光潔度的光學微結構
- ▶ Use 60 times less electricity than traditional infrared heating 比傳統紅外線加熱少60倍的耗電
- ▶ Equipment cost is one-third of traditional glass molding machine 設備成本是傳統玻璃成型機的三分之一

The conventional precision glass molding process is difficult to produce miniature optics as it involves infra-red heating which requires long thermal cycle time and will result with higher thermal deformation which will affect the accuracy of finishing product.

Rather than using the expensive tungsten carbides for hot molding, a special technique is developed to fabricate a graphene like material coated on a silicon die based on single point diamond turning. The glass workpiece is heated up directly via the coated silicon die and therefore it is not necessary to heat up the whole mold setup. A control and monitoring software is also developed to provide accurate and on-line control of the process parameters.



Comparing with the existing commercial glass molding machines, this design is environmentally friendly and cost effective and can produce a wide range of high-quality precision optical components to replace optical plastics, such as smartphones and micro projectors, compound eyes for 3D camera, Fresnel lens for solar cell applications, and micro-lens array for laser optical systems.

傳統的精密玻璃成型工藝利用了紅外線加熱，熱循環時間往往比較長，微型光學器件受到較大的熱變形。理大團隊因此開發了一種用於精密玻璃光學微結構和微透鏡印壓的新機器，基於單點金剛石切削的特殊技術，以及塗上類石墨烯材料來製造矽芯片。玻璃件直接通過矽芯片加熱，因此不需要加熱整個模具設置，減少耗電且具有成本效益。利用監控軟件來記錄參數軌跡，增加其精準度，有助生產各種高質量的精密光學件，如用於智能手機、微型投影儀和複眼三維相機的鏡頭。



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