

Precision grinding of tungsten carbide mold insert for molding of
submillimeter glass aspheric lenses

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Abstract

As the demand for precision optical components with sub-millimeter feature size steadily increasing, numerous efforts have been made in developing new techniques and in improving the existing approaches to efficiently and economically produce those components. Glass molding process (GMP) is one of these methods to enable mass production of precision glass optical components in recent years. One of the key issues in GMP is precision mold insert fabrication. Since the mould are normally made of hard and brittle materials such as tungsten carbide (WC) and silicon carbide (SiC), precision diamond grinding is by far the principal choice used to machine the GMP mould. As the feature size of optical component gets smaller, the size of mould and grinding wheel used to fabricate the mould gets smaller too. This makes the grinding process a very time consuming and expensive task. This research aimed to improve the small mold fabrication processes by developing an effective way of producing small diamond wheels and in-process monitoring wheel profile. Diamond wheels of around 0.2mm to 0.5mm in diameter after truing and WC aspheric mold insert of form accuracy around $0.47\mu\text{m}$ were successfully produced in this research.

Keyword : Precision grinding, glass molding, mini-aspheric lens, tungsten carbide