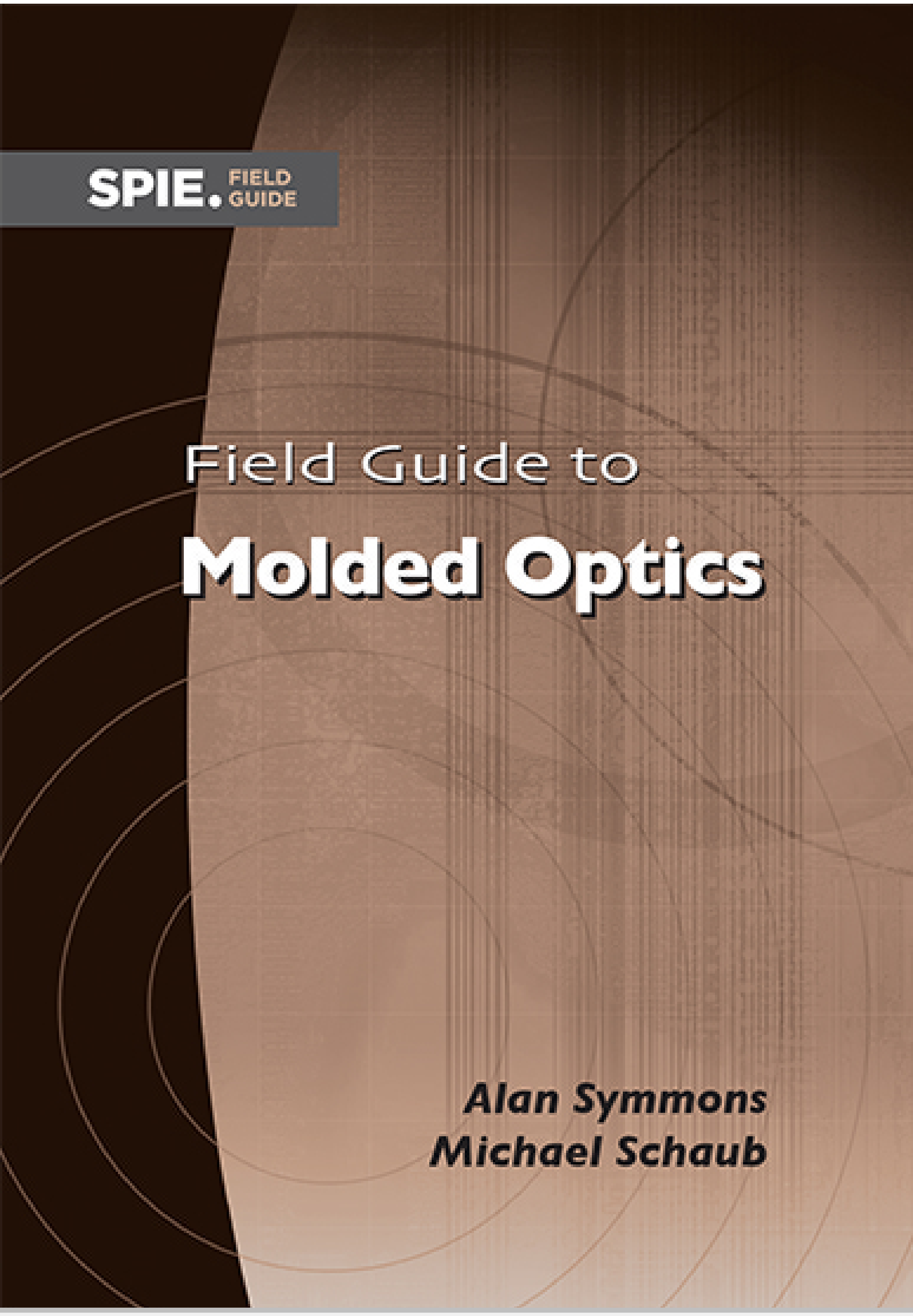
SPIE. FIELD GUIDE
Field Guide to
Molded Optics
Alan Symmons
Michael Schaub

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Molded Optics

Molded optics are conveniently categorized by the base material, plastic or glass. Subsequent classification can be further subdivided based on the manufacturing process.

Plastic molded optics can be injection molded, cast, or compressed/embossed.

Injection molding is the process of injecting molten plastic into a mold under pressure and then allowing it to cool. Injection-compression molding is a subset of this process and adds a compression step within the molding process.

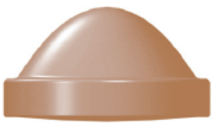
Cast plastic optics are primarily used for the ophthalmic industry. These are made simply by introducing liquid plastic resin into a mold and allowing it to solidify.

Molded plastic optics can also be formed using compression or embossing.

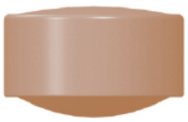
Glass molded optics are made using several processes: blank molding, traditional glass molding, and precision glass molding (PGM).

Blank molding is an old method of heating a glass blank in a furnace to a near-net shape for further processing.

Glass molding is a non-isothermal process in which a molten gob of glass is introduced into a mold and is allowed to cool.



PGM is typically an isothermal process in which a glass preform is formed by compression at a set temperature.



A further type of molded optics is **glass replication**, which consists of an ultraviolet (UV) monomer cured over a glass substrate.

Why Use Molded Optics?

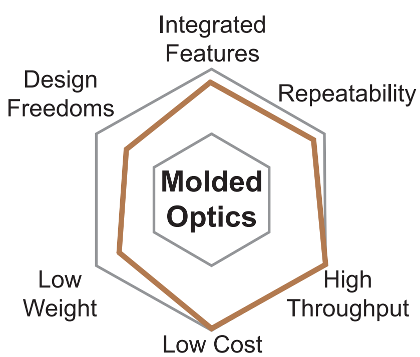
Molded optics first come to mind for high-volume applications. Why? Because molding is a process that can be replicated quickly with high throughput and low cost, two very desirable features for high-volume applications.

Molded optics provide many other potential advantages. **Injection-molded plastic optics** (IMPO) can incorporate a significant number of integrated features, thereby reducing part count and assembly complexity.

Optical molding processes lend themselves to high repeatability from component to component. This consistency can improve assembly and alignment, resulting in high performance and improved yields, which lead to cost savings.

Molding enables the replication of shapes that might not be achievable with conventional manufacturing techniques. Steeper slopes, advanced freeforms, and multisurface shapes can be achieved.

Molded plastic optics present a significant weight savings over their glass counterparts, while molded **chalcogenides** are lighter than their diamond-turned germanium substitutes.



Regardless of optical molding technology, the reasons for selecting a molding process are similar: high-volume manufacturing, lower cost, repeatability, integrated features, and design freedoms.

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