

# Next Generation Molding Technologies

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## Injection Molding Using Permanent Multi-Piece Molds: Space Puzzle Molds

- **Enable Manufacturing of Geometrically Complex Objects**
  - Objects that are impossible to make using traditional two-piece molds
  - Potential users: automobile parts, consumer appliance housings
- **Current Research Thrust**
  - Development of design for manufacturing guidelines for parts being produced using space puzzle molds
    - draft angles, section dimensions, tolerances
  - Development of geometric reasoning algorithms for automated design of multi-piece permanent molds
    - disassembly-based spatial partitioning
  - Development of geometric reasoning algorithms for efficient cutter path planning
    - hybrid strategies, adaptive feed rate adjustments

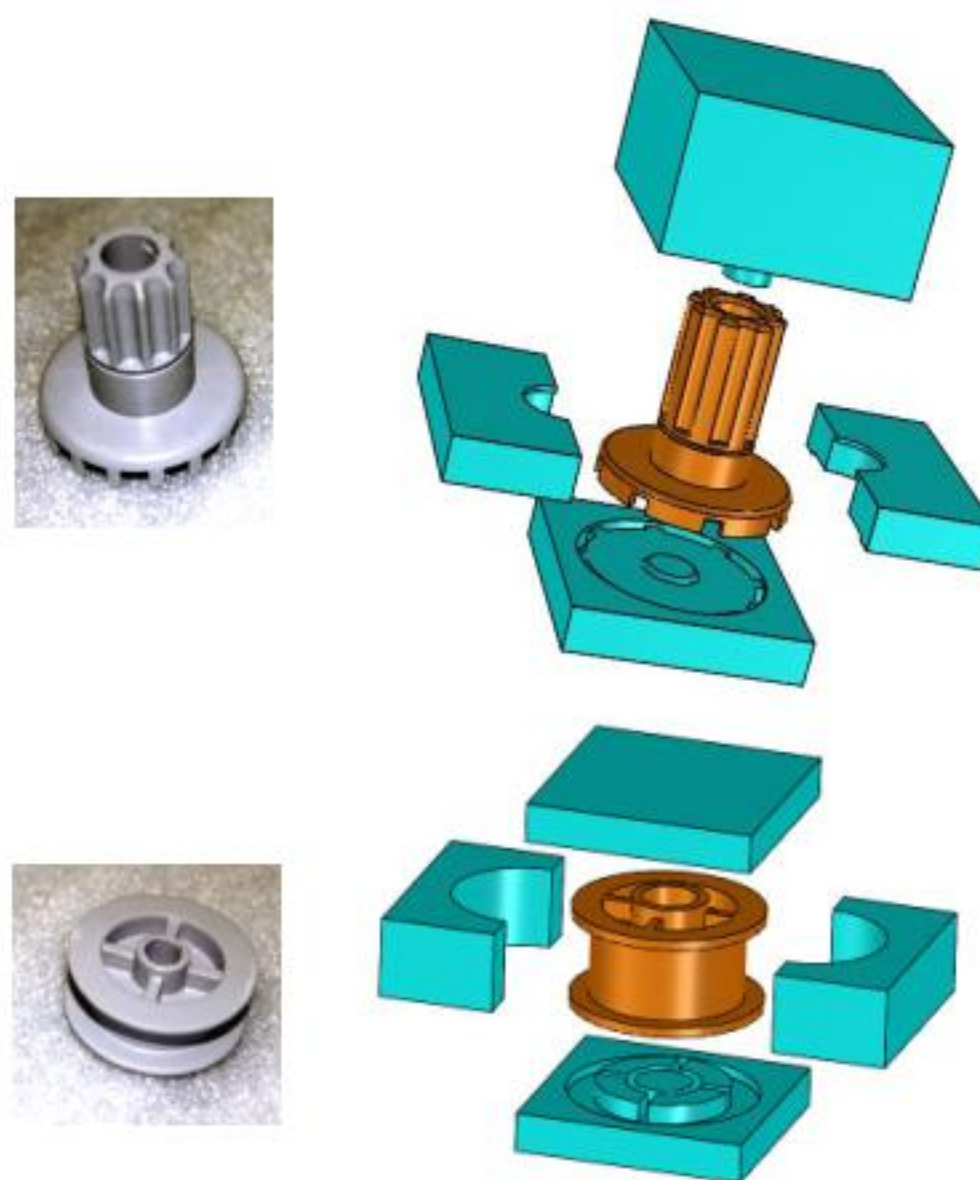
## Low Temperature Molding Using Sacrificial Multi-Piece Molds

- **Enable Manufacturing of Geometrically Complex Objects**
  - Objects that are impossible to make using permanent molding processes due to demolding problems
    - gelcasting of complex ceramic parts
  - Potential users: ceramic industry
- **Current Research Thrust**
  - Development of a molding process that combines CNC machining, layered fabrication, and injection molding for mold fabrication
    - large objects with very small features
    - low cost molds
  - Development of geometric reasoning algorithms for automated design of multi-piece sacrificial molds
    - accessibility and process driven spatial partitioning

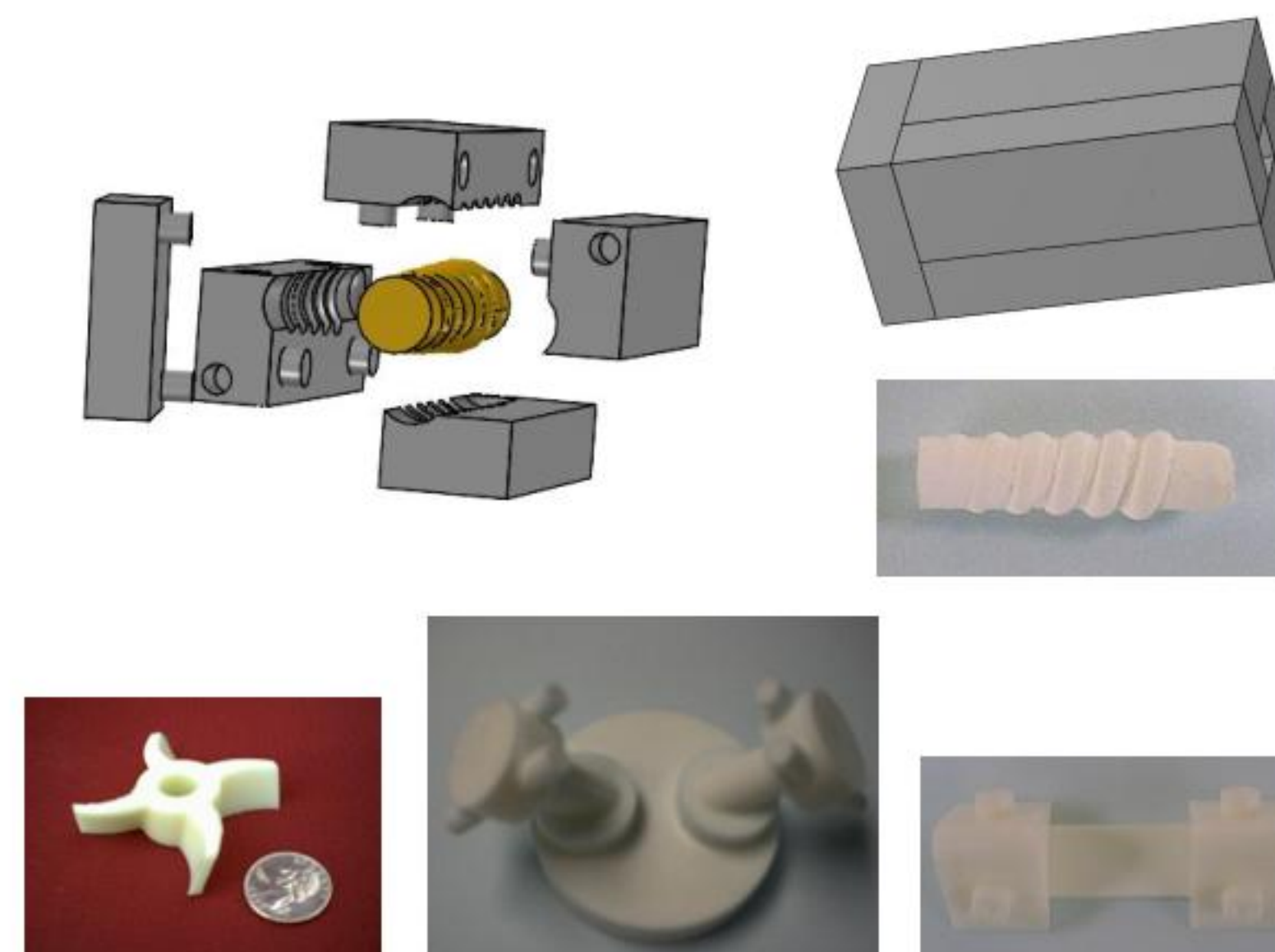
## Multi-Stage Molds for Producing Multi-Material Objects

- **Enable Manufacturing of Multi-Material Objects**
  - Difference in compliance, color, and hardness can be utilized to create products with superior performance
    - In-mold assembly: no assembly operations are needed afterwards
  - Potential users: automobile industry, furniture industry, toy industry, consumer products
- **Current Research Thrust**
  - Development of a new multi-stage molding process for providing geometrically complex interfaces
    - combination chemical, macroscopic, and mesoscopic interfaces
    - articulated assemblies
  - Development of geometric reasoning algorithms for automated design of multi-stage molds
    - disassembly and assembly driven spatial partitioning

## Examples of Objects Produced Using Permanent Multi-Piece Molds



## Examples of Objects Produced Using Sacrificial Multi-Piece Molds



## Examples of Parts Produced Using Multi-Stage Molding

