

## Chapter 8

# SELECTIVE INHIBITION OF SINTERING

Behrokh Khoshnevis<sup>1</sup> and Bahram Asiabanpour<sup>2</sup>

<sup>1</sup>*University of Southern California, Los Angeles, CA 90089-0193, khoshnev@usc.edu;* <sup>2</sup>*Texas State University-San Marcos, TX 78666, ba13@txstate.edu*

### Abstract:

SIS is a new method of building 3D objects using powder sintering. The method is capable of making plastic parts without the use of laser. An Alpha machine has been constructed and preliminary studies have been carried out to prove the concept and to explore the process variables and their impacts. Various polymers including polystyrene and polyester have been successfully used in our experiments. The approach should be feasible for a variety of polymers.

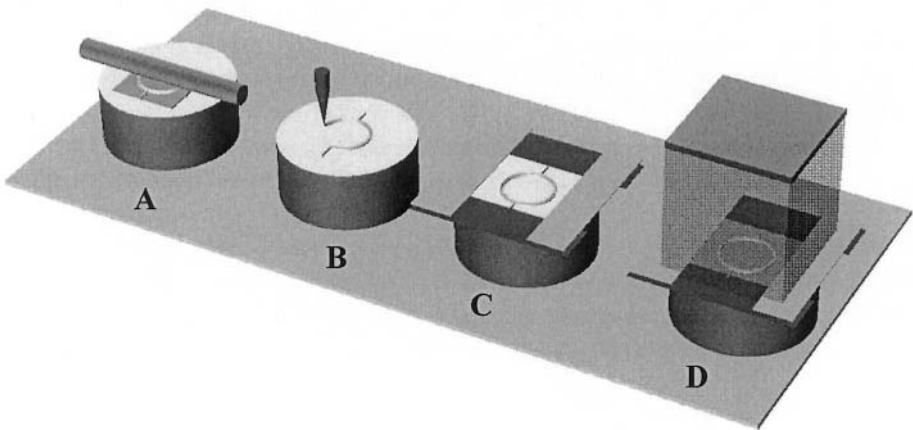
### Key words:

Layered Fabrication, Sintering, Sintering Inhibition, Droplet Deposition, Rapid Prototyping, SIS, NC Path Generation, Material Selection

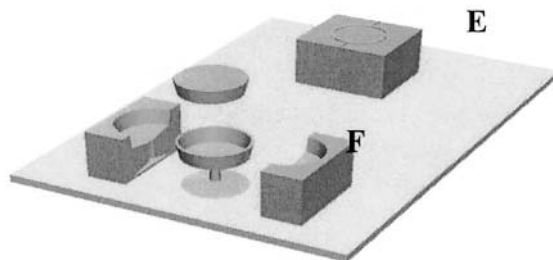
## 8.1. INTRODUCTION

The Selective Inhibition of Sintering process is a new RP method that, like many other RP processes, builds parts in a layer-by-layer fabrication

basis. The SIS process works by joining powder particles through sintering in the part's body, and by sintering inhibition at the part boundary. As shown in Figure 8-1, the SIS process starts by laying a thin layer of powder slightly above the previous layer, by sweeping a roller over both a powder supply tank and the build tank (A). Then, the areas of the powder bed selected for sintering inhibition are wetted by a printer (B). A radiation-minimizing frame is positioned to prevent areas of the powder layer which lie outside the part envelope from sintering (C). The entire layer is then sintered with a blast of thermal radiation from an infrared heater (D). As implemented on the Alpha machine, the heater is a coiled nichrome wire that is mounted on a carriage. This allows the heating element to be passed over the surface of the powder bed. Steps A-D are repeated until the part is completed. In the end (Figure 8-2), a solid polymeric block remains that is totally sintered except for those areas wetted by the inhibitor liquid (E). The final part can be easily extracted from surrounding material (F).



*Figure 8-1.* Stages of the SIS Process.



*Figure 8-2.* Extraction of the Fabricated Part.