CLAIMS

What is claimed is:

1. A method of fabricating a three-dimensional object, comprising the step of: operating a system for solid freeform fabrication of a three-dimensional object;

wherein said system comprises a solid freeform fabrication apparatus that deposits a semi-continuous flow or filament of building materials in a controlled manner;

so as to form the three-dimensional object;

wherein said building materials comprise a thermoplastic polyurethane derived from (a) a polyisocyanate component, (b) a polyol component, and (c) a chain extender component, whereint he mole ratio of the chain extender to the polyol is greater than 1.5;

wherein the resulting thermoplastic polyurethane has a crystallization temperature above 80°C; and

wherein the resulting thermoplastic polyurethane retains more than 20% of its shear storage modulus at 100°C relative to its shear storage modulus at 20°C.

2. The method of claim 1, wherein said solid freeform fabrication apparatus comprises (a) a plurality of dispensing heads; (b) a building material supply apparatus configured to supply a plurality of building materials to said fabrication apparatus; and (c) a control unit configured for controlling said fabrication apparatus and said building material supply apparatus, based on an operation mode selected from a plurality of predetermined operation modes.

3. The method of claim 1, wherein said solid freeform fabrication apparatus comprises a fused deposition modeling apparatus.

4. The method of claim 1, wherein the polyol has a number average molecular weight of at least 900.

5. The method of claim 1, wherein the polyisocyanate component comprises an aromatic diisocyanate.

6. The method of claim 1, wherein the polyisocyanate component comprises 4,4´-methylenebis(phenyl isocyanate).

7. The method of claim 1, wherein the polyol component comprises a polyether polyol, a polyester polyol, or a combination thereof.

8. The method of claim 1, wherein the polyol component comprises poly(tetramethylene ether glycol), polybutylene adipate, or a combination thereof.

9. The method of claim 1, wherein the chain extender component comprises a linear alkylene diol.

10. The method of claim 1, wherein the polyol component comprises poly(tetramethylene ether glycol).

11. The method of claim 1, wherein the polyol component comprises polybutylene adipate.

12. The method of claim 1, wherein the chain extender component comprises 1,4-butanediol.

13. The method of claim 1, wherein the thermoplastic polyurethane further comprises one or more colorants, antioxidants (including phenolics, phosphites, thioesters, and/or amines), antiozonants, stabilizers, inert fillers, lubricants, inhibitors, hydrolysis stabilizers, light stabilizers, hindered amines light stabilizers, benzotriazole UV absorber, heat stabilizers, stabilizers to prevent discoloration, dyes, pigments, inorganic and organic fillers, reinforcing agents, or any combinations thereof.