Claims:

1. A polishing pad having a polishing surface that is configured to polish a surface of a substrate, comprising:

a plurality of first polishing elements that each comprise a plurality of first An additive manufacturing polymer layers, wherein at least one of the plurality of first polymer layers forms the polishing surface; and

one or more second polishing elements that each comprise a plurality of second polymer layers, wherein at least a region of each of the one or more second polishing elements is disposed between at least one of the plurality of first polishing elements and a supporting surface of the polishing pad,

wherein the plurality of first polymer layers comprise a first polymer composition and the plurality of second polymer layers comprise a second polymer composition.

2. The polishing pad of claim 1, wherein the first polishing element comprises a first material and the second polishing element comprises a second material, and wherein the first material has a storage modulus that is greater than the second material.

3. The polishing pad of claim 1, The polishing pad of claim 1, wherein the first polishing element comprises a first material and the second polishing element comprises a second material, and the first material is formed from a first droplet composition and the second material is formed from a second droplet composition, and wherein

the second droplet composition comprises a greater amount of a resin precursor composition material than the first droplet composition, andfor forming at least a portion of a polishing article, comprising:

the resin an aliphatic acrylate oligomer;

an aromatic acrylate oligomer;

an acrylate monomer;

a photoinitiator; and

a viscosity thinning reactive diluent to provide the polymer precursor composition with a viscosity that enables the polymer precursor composition to be dispensed to form a portion of the polishing article by use of an additive manufacturing process.

2. The additive manufacturing polymer precursor composition of claim 1, wherein the aromatic oligomer is an aromatic urethane acrylate oligomer.

3. A polymer precursor composition for forming at least a portion of a polishing article, comprising:

a multifunctional aromatic acrylate oligomer;

an acrylate monomer;

a photoinitiator; and

a reactive diluent comprising one or a combination of 2-ethylhexyl acrylate, octyldecyl acrylate, cyclic trimethylolpropane formal acrylate, caprolactone acrylate and alkoxylated lauryl methacrylate,

wherein the polymer precursor composition has a viscosity that enables the polymer precursor composition to be dispensed to form a portion of the polishing article by use of an additive manufacturing process.

4. The additive manufacturing polymer precursor composition of claim 1, wherein the polymer precursor composition is jettable as droplets from a plurality of droplet ejecting nozzles of an additive manufacturing system.

5. The additive manufacturing polymer precursor composition of claim 2, wherein the acrylate monomer has a functionality of two or more.

6. ~~material~~ The additive manufacturing polymer precursor composition of claim 1, wherein

a polymer formed only of the polymer precursor composition has a glass transition temperature ~~of less~~that is greater than ~~or equal to about~~ 40 ~~°~~° C., and

the polymer precursor composition ~~.~~

~~4. The polishing pad of claim 1, wherein the first polishing element comprises a first material that comprises a polymeric material selected from the group consisting of: polyamides, polycarbonates, polyesters, polyether ketones, polyethers, polyoxymethylenes, polyether sulfones, polyetherimides, polyimides, polyolefins, polysiloxanes, polysulfones, polyphenylenes, polyphenylene sulfides, polyurethanes, polystyrene, polyacrylonitriles, polyacrylates, polymethylmethacrylates, polyurethane acrylates, polyester acrylates, polyether acrylates, epoxy acrylates, polycarbonates, polyesters, melamines, polysulfones, polyvinyl materials, acrylonitrile butadiene styrene (ABS), halogenated polymers, block copolymers and copolymers thereof.~~

~~5. The polishing pad of claim 1, wherein the first polishing element comprises a first material and the second polishing element comprises a second material, and an interface between the first material and the second material comprises a concentration gradient that is a mixture of the first material and the second material.~~

~~6. The polishing pad of claim 1, wherein the first polishing element comprises a first material and the second polishing element comprises the first material and a second material, and wherein the ratio of the amount of the first material to the second material in the second polishing element is less than one.~~

~~7. The polishing pad of claim 1, further comprising one or more substrate observation windows, wherein the observation windows are formed through at least a portion of the second polishing element, and the substrate observation window is transparent to an electromagnetic radiation bandwidth of wavelengths from 400 nm to 1550 nm.~~

~~8.~~ comprises a greater amount by weight of the multifunctional aliphatic acrylate oligomer than an amount by weight of the acrylate monomer.

7. ~~The polishing pad of claim 1, wherein the first polishing element comprises a first material and the second polishing element comprises a second material, and wherein the first material is formed from a first droplet composition and the second material is formed from a second droplet composition, and the first droplet~~

composition comprises a greater amount of oligomers and resin precursor composition materials that has a functionality greater than or equal to two than the second droplet composition.

9. The polishing pad of claim 1, wherein the first polishing element comprises a first material and the second polishing element comprises a second material, and wherein the first material is formed from a first droplet composition and the second material is formed from a second droplet composition, and the first droplet composition comprises oligomers and resin precursor composition materials that have a functionality greater than or equal to two and the second droplet composition comprises resin precursor composition materials that have a functionality less than or equal to two.

10. The additive manufacturing polymer precursor composition of claim 1, wherein a polymer formed of only the polymer precursor composition has a crosslinking density that is greater than 2%.

8. A polishing pad having a polishing surface that is configured to polish a surface of a substrate, comprising:
a plurality of first polishing elements that each comprise a plurality of first polymer layers that comprise a first polymer material, wherein at least A polymer precursor composition for forming at least a portion of a polishing article, comprising:

one of the plurality of first polymer layers forms the polishing surface; and

a base region that is disposed between at least one of the plurality of first polishing elements and a supporting surface of the polishing pad, wherein the base region comprises a plurality of layers that each comprise a plurality of cured droplets of a first resin precursor composition material and a plurality of cured droplets of a second resin precursor composition material.

11. The polishing pad of claim 10, wherein the first polymer material has a storage modulus that is greater than the second polymer material.

12. The polishing pad of claim 10, wherein first polymer material comprises a polymeric material or more aliphatic oligomers selected from thea group consisting of: polyamides, polycarbonates, polyesters, polyether ketones, polyethers, polyoxymethylenes, polyether sulfones, polyetherimides, polyimides, polyolefins, polysiloxanes, polysulfones, polyphenylenes, polyphenylene sulfides, polyurethanes, polystyrene, polyacrylonitriles, polyacrylates, polymethylmethacrylates, polyurethane aliphatic urethane acrylates, polyesteraliphatic hexafunctional urethane acrylates, polyetherlow viscosity diacrylates, aliphatic hexafunctional acrylates, epoxyand multifunctional urethane acrylates, polycarbonates, polyesters, melamines, polysulfones, polyvinyl materials, acrylonitrile butadiene styrene (ABS), halogenated polymers, block copolymers and copolymers thereof.;

13. one or more aromatic acrylate oligomers or monomers; a photoinitiator selected from a group consisting of benzoin ethers, benzyl ketals, acetyl phenones, alkyl phenones, phosphine oxides, benzophenone compounds, and thioxanthone compounds; and

a reactive diluent selected from a group consisting of 2-ethylhexyl acrylate, octyldecyl acrylate, cyclic trimethylolpropane formal acrylate, caprolactone acrylate and alkoxylated lauryl methacrylate,

wherein the polymer precursor composition has a viscosity that enables the polymer precursor composition to be ejected in droplets from a nozzle of a droplet ejecting additive manufacturing system to form a portion of the polishing article.

9. ~~The polishing pad of claim 10, wherein the first~~ The polymer ~~material comprises a plurality of cured droplets of the first resin~~ precursor composition ~~material, and the ratio of the plurality of cured droplets of the first resin~~of claim 8, wherein a polymer formed only of the polymer precursor composition has a glass transition temperature (T.sub.g) that is greater than 40° C.

10. ~~material to the plurality of cured droplets of the second resin~~The polymer precursor composition ~~material in the base region is less than one.~~of claim 8, wherein a polymer formed of only the polymer precursor composition has a crosslinking density that is greater than 2%.

~~14. A method of forming~~

11. The polymer precursor composition of claim 8, further comprising an acrylate monomer having a functionality of two or more.

12. The polymer precursor composition of claim 11, wherein the polymer precursor composition comprises a greater amount by weight of the one or more oligomers than an amount by weight of the acrylate monomer.

13. An additive manufacturing polymer precursor composition for forming at least a portion of a polishing article, comprising:

~~dispensing~~ a functional aliphatic acrylate oligomer comprising an aliphatic monofunctional urethane acrylate, an aliphatic monofunctional acrylate, an aliphatic difunctional acrylate, an aliphatic multifunctional urethane acrylate having a functionality that is greater than or equal to 2, or a combination thereof, wherein the functional aliphatic acrylate oligomer has a first ~~droplet of a~~ viscosity;

a chemical component having an aromatic group;

a photoinitiator; and

a viscosity thinning reactive diluent,

wherein the polymer precursor composition has a second viscosity that is less than the first ~~liquid on a surface of~~viscosity, and the polymer precursor composition is printable as droplets from one or more nozzles of an additive manufacturing system to form a portion of ~~a~~the polishing article.

14. The additive manufacturing polymer precursor composition of claim 13, wherein the chemical component having the aromatic group is an acrylate.

15. ~~body, wherein the surface~~The additive manufacturing polymer precursor composition of claim 13, wherein the functional aliphatic acrylate oligomer has a functionality of two or more.

16. The additive manufacturing polymer precursor composition of claim 13, wherein the reactive diluent comprises ~~a first material~~one of 2-ethylhexyl acrylate, octyldecyl acrylate, cyclic trimethylolpropane formal acrylate, caprolactone acrylate, alkoxylated lauryl methacrylate, isobornyl acrylate, decyl acrylate, glycidyl methacrylate, or a combination thereof.

17. The additive manufacturing polymer precursor composition of claim 13, wherein a polymer formed ~~by curing an amount of the first liquid; and~~only of the polymer precursor composition has a glass transition temperature (T.sub.g) that is greater than 40° C.

~~exposing the dispensed first droplet of the first liquid to electromagnetic radiation for a first period of time to only partially cure the material within the first droplet, wherein exposing the dispensed first droplet of the first liquid occurs after a second period of time has elapsed, and the second time starts when the first droplet is disposed on the surface.~~

~~15.~~

18. The ~~method~~additive manufacturing polymer precursor composition of claim ~~14~~1, wherein

the ~~partially cured first droplet has~~aliphatic acrylate oligomer comprises an aliphatic monofunctional urethane acrylate, an aliphatic monofunctional acrylate, an aliphatic difunctional acrylate, an aliphatic multifunctional urethane acrylate having a ~~contact angle relative to the surface of~~functionality that is greater than or equal to ~~50 degrees~~2, or a combination thereof.