WHAT IS CLAIMED IS:

1. A method of coating a target material, the method comprising:

providing a target material having a surface;

incubating the surface with a polymerizable material or a cross-linking agent, and a carrier composition including (i) the cross-linking agent or the polymerizable material, respectively, and (ii) a cell, a bead or a particle; and

washing the surface to remove excess carrier composition, wherein,

the cell, the bead or the particle is immobilized on or in an interfacial layer of the material polymerized on the surface;

wherein the surface comprises a lumenal surface, and

wherein the lumenal surface comprises a patterned network of hollow channels.

2. The method of claim 1, further comprising washing the surface to remove unbound cross-linking agent after the surface is incubated with the cross-linking agent or the carrier composition including the cross-linking agent.

3. The method of claim 1 or 2, wherein a duration of the incubating is modulated to control a thickness of the interfacial layer.

4. The method of any one of claims 1-3, wherein the cell is a lumenal cell including a fibroblast, a pericyte, an endothelial cell, an epithelial cell, or a smooth muscle cell.

5. The method of any one of claims 1-4, wherein the bead or the particle includes or is linked to a detectable label, a sensor, or a therapeutic agent.

6. The method of any one of claims 1-5, wherein the surface is located in between concentric layers of smooth muscle cells and endothelial cells.

7. The method of any one of claims 1-6, wherein the target material is a hydrogel, a biomaterial, or a decellularized tissue or organ.

8. The method of claim 7, wherein the hydrogel is a 3D-printed hydrogel.

9. The method of claim 7, wherein the hydrogel is formed by casting around a sacrificial template including a vascular template.

10. The method of any one of claims 1-9, wherein
(i) the cross-linking agent is thrombin and the polymerizable material is fibrinogen;
(ii) the cross-linking agent is transglutaminase and the polymerizable material is gelatin or gelatin methacrylate;
(iii) the cross-linking agent is Ca^{2+} and the polymerizable material is alginate;
(iv) the cross-linking agent is ammonium persulfate/TEMED and the polymerizable material is gelatin methacrylate, PEG-diacrylate, collagen methacrylate, silk methacylate, hyaluronic acid methacrylate, chondroitin sulfate methacrylate, elastin methacrylate, cellulose acrylate, dextran methacrylate, heparin methacrylate, NIPAAm methacrylate, chitosan methacrylate, methacrylated decellularized ECM, PEG based peptide conjugates, or combinations thereof;
(v) the cross-linking agent is a cysteine-terminated peptide and the polymerizable material is PEG-diacrylate;
(vi) the cross-linking agent is lithium acylphosphinate/light and the polymerizable material is gelatin methacrylate, PEG-diacrylate, collagen methacrylate, silk methacylate, hyaluronic acid methacrylate, chondroitin sulfate methacrylate, elastin methacrylate, cellulose acrylate, dextran methacrylate, heparin methacrylate, NIPAAm methacrylate, chitosan methacrylate, methacrylated decellularized ECM, PEG based peptide conjugates, or combinations thereof; or
(vii) the cross-linking agent is peroxidase and the polymerizable material is silk fibroin.

11. The method of any one of claims 1-10, wherein the cross-linking agent and the polymerizable material are a click-chemistry pair.

12. The method of any one of claims 1-11, wherein the cross-linking agent is activated by light.

13. The method of claim 12, wherein the carrier composition exhibits an index of refraction greater than the target material.

14. The method of any one of claims 1-13, wherein a ratio of a thickness of the surface to a thickness of the interfacial layer is between about 100:1 to about 10,000:1.