What is claimed is:

1. A method, comprising:
forming a surface-modified patterned wafer by:
attaching a silane or a silane derivative to a surface of a patterned wafer including depressions separated by interstitial regions, thereby forming silanized depressions and silanized interstitial regions;
forming a coating layer of a functionalized molecule in the silanized depressions and on the silanized interstitial regions, wherein the functionalized molecule is a hydrogel;
polishing the coating layer from the silanized interstitial regions while leaving the coating layer in the silanized depressions and leaving the surface of the patterned wafer at least substantially intact, wherein the polishing is performed using i) a basic, aqueous slurry having a pH ranging from about 7.5 to about 11 and including an abrasive particle having a hardness that is less than a hardness of the patterned wafer and a polyacrylate dispersant, the abrasive particle being selected from the group consisting of calcium carbonate, agarose, graphite, poly(methyl methacrylate), and polystyrene, or ii) a polishing pad and a solution free of the abrasive particle; and
grafting a primer to the coating layer in the silanized depressions to form functionalized depressions; and
bonding two of the surface-modified patterned wafers together with a spacer layer therebetween.

2. The method as defined in claim 1 wherein attaching the silane or the silane derivative to the surface of the patterned wafer involves at least one of vapor deposition, spin coating, chemical vapor deposition, or Yield Engineering Systems (YES) method.

3. The method as defined in claim 1 wherein forming the coating layer of the functionalized molecule involves reacting a functional group of the functionalized molecule with an unsaturated moiety of the silane or silane derivative, and optionally wherein the unsaturated moiety is selected from the group consisting of cycloalkenes,

cycloalkynes, heterocycloalkenes, heterocycloalkynes, substituted variants thereof, and combinations thereof.

4. The method as defined in claim 1 wherein forming the coating layer of the functionalized molecule includes:
depositing a solution including the functionalized molecule onto the silanized depressions and the silanized interstitial regions; and
curing the functionalized molecule.

5. The method as defined in claim 1 wherein the basic, aqueous slurry further includes a chelating agent, a surfactant, or a combination thereof.

6. The method as defined in claim 1 wherein grafting of the primer to the coating layer involves dunk coating, spray coating, puddle dispensing, or a combination thereof.

7. The method as defined in claim 1, further comprising plasma ashing the patterned wafer prior to attaching the silane or the silane derivative.

8. The method as defined in claim 1 wherein the coating layer of the functionalized molecule has a thickness of about 200 nm or less.

9. The method as defined in claim 1, further comprising dicing the bonded surface-modified patterned wafers into respective flow cells.

10. The method as defined in claim 1 wherein the spacer layer is a radiation-absorbing material.

11. The method as defined in claim 10, wherein the bonding involves:
positioning the radiation-absorbing material at an interface between the two surface-modified patterned wafers such that the radiation-absorbing material contacts at least

some of the interstitial regions of each of the two surface-modified patterned wafers; and

applying compression at the interface and irradiating the radiation-absorbing material.

12. The method as defined in claim 1 wherein the spacer layer includes a radiation-absorbing material in contact therewith.

13. The method as defined in claim 12, wherein the bonding involves:

positioning the radiation-absorbing material at a respective interface between the spacer layer and each of the two surface-modified patterned wafers such that the radiation-absorbing material contacts at least some of the interstitial regions of each of the two surface-modified patterned wafers; and

applying compression at the respective interfaces and irradiating the radiation-absorbing material.

14. The method as defined in claim 10 wherein:

the two surface-modified patterned wafers are positioned so that at least some of the functionalized depressions of one of the two surface-modified patterned wafers are aligned with a respective functionalized depression of another of the two surface-modified patterned wafers to form a fluidic chamber; and

the spacer layer defines longitudinal walls between adjacent fluidic chambers.

15. The method as defined in claim 14 wherein each of the functionalized depressions is:

in a flow channel defined by the two bonded surface-modified patterned wafers; or

one of a plurality of wells within the flow channel.

16. A method, comprising:

forming a surface-modified patterned wafer by:

plasma ashing a surface of a patterned wafer including depressions separated by interstitial regions;

forming a coating layer of a functionalized molecule in the depressions and on the interstitial regions, wherein the functionalized molecule is a hydrogel;
polishing the coating layer from the interstitial regions while leaving the coating layer in the depressions and leaving the surface of the patterned wafer at least substantially intact, wherein the polishing is performed, using i) a basic, aqueous slurry having a pH ranging from about 7.5 to about 11 and including an abrasive particle having a hardness that is less than a hardness of patterned wafer and a polyacrylate dispersant, the abrasive particle being selected from the group consisting of calcium carbonate, agarose, graphite, poly(methyl methacrylate), and polystyrene, or ii) a polishing pad and a solution free of the abrasive particle; and
grafting a primer to the coating layer in the depressions to form functionalized depressions; and
bonding two of the surface-modified patterned wafers together with a spacer layer therebetween.

17. The method as defined in claim 1 wherein the polyacrylate dispersant is poly(acrylic acid sodium salt).

18. The method as defined in claim 1 wherein the hydrogel is poly(N-(5-azidoacetamidylpentyl) acrylamide-co-acrylamide).

19. The method as defined in claim 1 wherein the abrasive particles have an average particle size ranging from about 700 nm to about 5 μm.

20. The method as defined in claim 1, wherein the basic, aqueous slurry consists of the abrasive particle, the polyacrylate dispersant, a buffer, a chelating agent, a surfactant, and water.

21. The method as defined in claim 1, wherein the polishing uses the solution free of the abrasive particle.