repeating said steps of exposing the selected surfaces of the microchannel to the first solution and said exposing the selected surfaces of the microchannel to the second solution, alternately, as necessary, to form a desired number of polyelectrolyte multilayers on the selected surfaces.

21. The method of claim **20**, wherein said steps of exposing the selected surface produces a positively charged microchannel.

22. The method of claim **20**, wherein the negatively charged polyelectrolytes comprise poly(styrene sulfonate).

23. The method of claim **20**, wherein the positively charged polyelectrolytes comprise poly(allylamine hydrocholide).

24. The method of claim **20**, wherein said steps of exposing the surfaces of the microchannel to the first solution and exposing the surfaces of the second solution comprises filling the microchannel with the respective solution and allowing the respective polyelectrolyte to adsorb to the selected surfaces or previous layer of the microchannel.

25. The method of claim **20**, wherein said step of providing a substrate further comprises providing a lid over the microchannel, the lid having a lid surface facing the microchannel.

26. The method of claim **20**, wherein the lid surface has a charge opposite a charge on an outmost layer of the polyelectrolytic multilayers.

27. The method of claim **20**, wherein the lid is placed over the channel prior to PEM deposition and the lid is derivatized in a similar manner as the selected surfaces of the microchannel.

28. The method of claim **20**, further comprising the step of selectively depositing a charged layer on a selected first microchannel surface having a charge opposite a charge on an outermost layer disposed on a selected second microchannel surface.

29. The method of claim **28**, wherein said step of selectively depositing a charged layer comprises:

using a laminar flow patterning to fill one half of the microchannel with a selected polyelectrolyte solution having a charge opposite a charge of an outermost layer of the polyelectrolyte multilayers and to fill the other half of the microchannel with a solution that does not contain the selected polyelectrolyte.

30. The method of claim **20**, wherein the microchannel is formed from two intersecting subchannels thereby defining at least three arms.

31. The method of claim **30**, wherein the selected surfaces are surfaces of one of the arms.

32. The method of claim **30**, further comprising selectively exposing the surfaces of at least one said arm to a desired charged polyelectrolyte solution having a charge opposite a charge of an outermost layer of the polyelectrolyte layers on the surfaces of at least one remaining arm.

33. The method of claim **20**, further comprising the step of re-generating an outermost layer of the polyelectrolyte multilayers by re-exposing the selected surfaces to the polyelectrolyte solution last applied.

34. The method of claim **20**, further comprising the step of immobilizing selected molecules to an outermost layer of the polyelectrolyte multilayers.

35. The method of claim **34**, wherein the molecules are selected from the group consisting of proteins, antibodies and DNA.

36. The method of claim **35**, wherein said step of immobilizing the selected molecules comprises adding the selected molecules to at least one of the first solution and second solution.

37. A microchannel device, comprising:

a plastic substrate having a microchannel formed therein, said microchannel comprising, a first longitudinally extending portion having an outermost surface and a second adjacent longitudinally extending portion having an outermost surface;

a first polyelectrolyte layer disposed on the outermost surface of said first portion and a second polyelectrolyte layer disposed on the outermost surface of said second portion, said first polyelectrolyte layer and said second polyelectrolyte layer having opposite charges; and

a lid disposed over said microchannel and having a lid surface facing said microchannel.

38. The microchannel device of claim **37** wherein said first polyelectrolyte layer comprises an outermost layer of a first polyelectrolyte multilayer disposed on said first portion.

39. The microchannel device of claim **37** wherein said second polyelectrolyte layer comprises an outermost layer of a second polyelectrolyte multilayer disposed on said second portion.

40. The microchannel device of claim **37**, wherein said plastic substrate comprises a plastic selected from the group consisting of polystyrene, poly(ethylene terephthalate glycol), poly(methyl methacrylate), and polycarbonate.

41. The microchannel device of claim **37**, wherein said first polyelectrolyte layer comprises poly(allylamine hydrochloride).

42. The microchannel device of claim **37**, wherein said second polyelectrolyte layer comprises poly(styrene sulfonate).

* * * * *