wafer bonding methods. In various embodiments, the further optical detector may also be an unpackaged die bonded to the further cell. The optical source 108 may also be bonded to the further cell.

[0033] FIG. 2 is a general illustration of a method of forming a chemical sensor according to various embodiments. The method may include, in 202, forming one or more metal layers between a first semiconductor substrate and a second semiconductor substrate such that the first semiconductor substrate, the second semiconductor substrate and the one or more metal layers form a cell including a cavity. The cavity may have a depth of any value equal to or less than 100 μm. The method may also include, in 204, providing an optical source. The method may further include, in 206, providing an optical detector such that light emitted by the optical source passes through the cell to the optical detector. The first semiconductor substrate, the second semiconductor substrate and the one or more metal layers may also define at least one inlet for fluid to flow into the cavity and at least one outlet for fluid to flow out of the cavity.

[0034] In other words, the method may include forming a cell with a cavity by bonding or adhering the first semiconductor substrate and the second semiconductor substrate together using one or more metal layers. The cavity may have a depth of any value equal to or less than 100 μm. The method may also include providing an optical source and an optical detector such that light from the optical source passes through the cell or cavity, to the optical detector.

[0035] For avoidance of doubt, the steps shown in FIG. 2 may or may not be in sequence. For instance, step 206 may be after, before or at the same time as step 204.

[0036] In various embodiments, the cavity may have a depth of any value less than 100 μm.

[0037] In various embodiments, the first semiconductor substrate and the second semiconductor substrate may include a suitable semiconductor material such as silicon or germanium.

[0038] In various embodiments, the first semiconductor substrate may be patterned before forming a first adhesion layer of the one or more metal layers in contact with the first semiconductor substrate and forming a first bonding layer of the one or more metal layers in contact with the first adhesion layer. The second semiconductor substrate may be patterned before forming a second adhesion layer of the one or more metal layers in contact with the second semiconductor substrate, and forming a second bonding layer of the one or more metal layers in contact with the second adhesion layer. The method may further include bonding the first bonding layer and the second bonding layer to form the cell including the cavity.