CLAIMS

What is claimed.

1. A system for detecting changes in pressure in an immersion medium or solid, the system comprising:

an optical fiber, wherein the optical fiber has a diameter at an immersion surface contact of the fiber of less than 10 um; and

a layer of material deposited on a tip of the fiber, wherein the layer of material is of a thickness of from about 2 nm to about 10 nm.

2. The system of claim 1 comprising an optical fiber consists of a core and clad, wherein the diameter of the fiber has been reduced to less than 10um at the fiber tip.

3. The system of claim 1 comprising a layer of material deposited on the tip of the fiber, wherein the material is deposited on both the end face and outside of a cylindrical surface of the fiber tip as optical hydrophone.

4. The system of claim 1 further comprising a light source and a detector.

5. The system of claim 1 further comprising a computer controller and analyzer that is programmed to relate back reflected optical signals from the tip of the fiber to the changes in acoustic/ultrasound pressure.

6. The system of claim 1 wherein the layer of material is a layer comprising one or more dielectrics.

7. The system of claim 1 wherein the layer of material is a layer comprising one or more of a metal and a dielectric.

8. The system of claim 1 further comprising a light source and a detector, wherein the light source comprises a laser having a wavelength output within a range of from about 500 nm to about 1700 nm.

9. The system of claim 1 wherein the thickness of the layer of material is of from about 3.5 nm to about 8 nm.

10. The system of claim 1 wherein the tip of the fiber comprises a taper angle and a taper length.

11. The system of claim 10 wherein the taper angle is of from about 0 to about 45, and wherein the taper length is of from about 10 um to about 1 mm.

12. The system of claim 1 further comprising a light source and a detector, wherein the detector is configured to detect light back reflected from the layer of material and wherein the changes in light reflected back from the layer of material are measured by the detector.

13. The system of claim 1 further comprising a light source and a detector, wherein the detector is configured to detect light back reflected from the layer of material and wherein changes in light reflected back from the layer of material are measured by phase detection scheme such as I/Q demodulation and an interferometric system.

14. The system of claim 1 further comprising a light source and a detector, wherein the detector is configured to detect light back reflected from the layer of material and wherein changes in light reflected back from the layer of material are measured by a spectrum analyzer.

15. A method for detecting pressure of acoustic or ultrasound waves in an immersion medium or solid, the method comprising:

contacting the immersion medium or solid with a modified fiber optic including a tip;

wherein the fiber optic is integrated with a light source and a detector, and

wherein the fiber optic tip has a diameter of less than 10 um at an immersion surface contact of the fiber optic tip;

providing a thin layer of material on the fiber optic tip, wherein the thin layer of material is of a thickness in a range of from about 2 nm to about 10 nm; and

detecting acoustic/ultrasound pressure waves in the immersion medium based on a direct interaction of optical and evanescent electromagnetic fields and ultrasound fields within the fiber optic tip and within the immersion medium.

16. The method of claim 15 wherein the layer of material deposited on the fiber tip is coated and covering on the surface of the fiber tip as well as an end face of the fiber tip.

17. The method of claim 15 wherein the thickness of the layer of material deposited on the fiber tip is adjusted for optimal sensitivity in detecting acoustic waves pressure in immersion medium.

18. The method of claim 15 wherein the optical fiber has a core and a cladding, wherein the cladding is etched/removed away in the fiber tip before coating a thin layer material.

19. The method of claim 15 further comprising detecting an object in the immersion medium by correlating changes in back reflected optical signals and ultrasound pressure in immersion medium.

20. The method of claim 15 wherein a correlation between reflected optical signals and acoustic/ultrasound pressure includes changes in intensity, phase, and wavelength of an optical signal and changes in intensity, phase, and wavelength of acoustic/ultrasound source.