

CLAIMS

We claim:

1. An apparatus for forming a sample in a wellbore, comprising:
 - a drill bit configured to form a core; and
 - at least one retractable cutter internal to the drill bit configured to cut the sample from the core.
2. The apparatus of claim 1, the drill bit further comprising:
 - a chamber configured to receive the sample.
3. The apparatus of claim 2, further comprising:
 - an extractor disposed adjacent to the chamber and configured to extract the fluid from the sample.
4. The apparatus of claim 3, further comprising:
 - at least one analysis module operably coupled to the extractor and configured to analyze the extracted fluid.
5. The apparatus of claim 3, wherein the at least one analysis module includes at least one of: (i) a gas chromatograph and (ii) a fluid analyzer.
6. The apparatus of claim 3, wherein the extractor comprises at least one of: (i) a heater, (ii) a mechanical pulverizer, (iii) an acoustic driver, and (iv) a filter.
7. The apparatus of claim 3, wherein the extractor is configured perform on the sample at least one of: (i) a compression test, (ii) a strain test, and (iii) a fracture test.
8. The apparatus of claim 2, further comprising:
 - an analysis module positioned adjacent to the chamber and configured to apply a stimulus to the sample.
9. The apparatus of claim 8, wherein the stimulus is at least one of: (i) pressure, (ii) heat, (iii) acoustic energy, (iv) a magnetic field, (v) electromagnetic radiation, and (vi) force.

10. The apparatus of claim 8, further comprising:

a processor configured to modify at least one drilling parameter using data acquired by the analysis module.

11. The apparatus of claim 2, further comprising:

an encapsulator operably coupled to the chamber and configured to at least partially encapsulate at least part of the sample in an encapsulating material.

12. The apparatus of claim 11, wherein the encapsulating material is at least one of:

(i) a polymer, (ii) a gel, (iii) a metallic coating, and (iv) a clay.

13. The apparatus of claim 11, wherein the encapsulating material is easily distinguishable from drilling fluid and unencapsulated materials from the wellbore.

14. The apparatus of claim 2, further comprising:

a tagging device adjacent to the chamber and configured to tag the sample.

15. The apparatus of claim 14, wherein the tagging device is configured to tag the sample using at least one of: (i) a laser marker, (ii) an ultrasonic blasting tool, (iii) a powder blasting tool, (iv) radioactive tracers, (v) magnetic particles, and (vi) a chip inserter.

16. The apparatus of claim 2, further comprising:

a pressure applicator disposed adjacent to the chamber and configured to modify the pressure of the chamber.

17. The apparatus of claim 1, wherein the sample is at least one of: (i) a core sample and (ii) a cutting.

18. An apparatus for encapsulating a sample in a wellbore, comprising:

a drill bit configured to form a core;

a chamber configured to receive the sample from the core; and

an encapsulater operably coupled to the chamber and configured to at least partially encapsulate at least part of the sample in an encapsulating material.

19. The apparatus of claim 18, wherein the encapsulating material is at least one of: (i) a polymer, (ii) a gel, (iii) a metallic coating, and (iv) a clay.
20. The apparatus of claim 18, wherein the encapsulating material is easily distinguishable from drilling fluid and unencapsulated materials from the wellbore.
21. An apparatus of claim 18, further comprising:
 - at least one retractable cutter internal to the drill bit configured to cut the sample from the core.
22. A method of taking a sample in a wellbore, comprising:
 - using a drill bit conveyed into the wellbore to form a core; and
 - using at least one retractable cutter internal to the drill bit for cutting the sample from the core.
23. The method of claim 22, further comprising:
 - estimating a value of a property of interest using a response of the sample to a stimulus.
24. The method of claim 23, further comprising:
 - applying the stimulus to the sample.
25. The method of claim 24, further comprising:
 - modifying at least one drilling parameter using a response of the sample to the stimulus.
26. The method of claim 23, further comprising applying the stimulus by using, at least one of: (i) pressure, (ii) heat, (iii) acoustic energy, (iv) a magnetic field, (v) electromagnetic radiation, and (vi) force.
27. The method of claim 22, further comprising:
 - extracting a fluid from the sample.

28. The method of claim 27, further comprising:

estimating a property of interest using the extracted fluid.

29. The method of claim 27, using, to extract the fluid, at least one of: (i) fluid pressure, (ii) mechanical compression, (iii) heating, (iv) acoustic waves, and (v) a filter.

30. The method of claim 27, using, to estimate the property of interest, at least one of: (i) a gas chromatograph and (ii) a fluid analyzer.

31. The method of claim 22, further comprising:

encapsulating at least part of the sample in an encapsulating material.

32. The method of claim 31, using, as the encapsulating material, at least one of: (i) a polymer, (ii) a gel, (iii) a metallic coating, and (iv) a clay.

33. The method of claim 22, further comprising:

marking the sample using a tagging device.

34. The method of claim 33, using, for the tagging device, at least one of: (i) a laser marker, (ii) an ultrasonic blasting tool, (iii) a powder blasting tool, (iv) radioactive tracers, (v) magnetic particles, and (vi) a chip inserter.

35. The method of claim 34, further comprising:

marking the encapsulating material using a tagging device.

36. A method for encapsulating a sample in a wellbore, comprising:

using a drill bit in the wellbore for forming a core;

using a retractable cutter internal to the drill bit for cutting a sample from the core and conveying the sample to a receiving chamber; and

using an encapsulater operably coupled to the receiving chamber for at least partially encapsulating at least part of the sample in an encapsulating material.

37. The method of claim 36, using, as the encapsulating material, at least one of: (i) a polymer, (ii) a gel, (iii) a metallic coating, and (iv) a clay.

38. The method of claim 36, further comprising:

marking the encapsulating material using a tagging device.

CLAIMS

We claim:

1. An apparatus for encapsulating a sample in a wellbore, comprising:
 - a drill bit configured to form a core;
 - a chamber configured to receive the sample from the core;
 - an encapsulator operably coupled to the chamber and configured to at least partially encapsulate at least part of the sample in an encapsulating material; and
 - a pressure applicator increasing a pressure on the sample before the sample is at least partially encapsulated.
2. The apparatus of claim 1, wherein the encapsulating material is at least one of: (i) a polymer, (ii) a gel, (iii) a metallic coating, and (iv) a clay.
3. The apparatus of claim 1, wherein the encapsulating material is easily distinguishable from drilling fluid and unencapsulated materials from the wellbore.
4. An apparatus of claim 1, further comprising:
 - at least one retractable cutter internal to the drill bit configured to cut the sample from the core.
5. A method for encapsulating a sample in a wellbore, comprising:
 - using a drill bit in the wellbore for forming a core;
 - using a retractable cutter internal to the drill bit for cutting a sample from the core and conveying the sample to a receiving chamber;
 - using a pressure applicator to increase a pressure on the sample; and
 - using an encapsulator operably coupled to the receiving chamber for at least partially encapsulating at least part of the sample in an encapsulating material after pressure has been increased on the sample.

6. The method of claim 5, using, as the encapsulating material, at least one of: (i) a polymer, (ii) a gel, (iii) a metallic coating, and (iv) a clay.
7. The method of claim 5, further comprising:
marking the encapsulating material using a tagging device.
8. An apparatus for encapsulating a sample in a wellbore, comprising:
a drill bit configured to form a core;
a chamber configured to receive the sample from the core;
an encapsulater operably coupled to the chamber and configured to at least partially encapsulate at least part of the sample in an encapsulating material; and
a pressure applicator varying a pressure on the sample in the chamber.
9. The apparatus of claim 8, further comprising a storage module receiving the sample from the chamber; and at least one seal selectively isolating the storage module from the chamber.
10. The apparatus of claim 8, further comprising a fluid analysis module receiving a fluid from the sample before encapsulation, the fluid analysis module estimating at least one parameter relating to the extracted fluid.
11. An apparatus of claim 8, wherein the encapsulater is configured to at least partially encapsulate the sample while the sample is pressurized by the pressure applicator.