Claims:

1. A process for preparing hydrogen, the process comprising:

(a) providing an alkaline solution; and

(b) reacting the alkaline solution with a silicon material so as to produce hydrogen.

2. The process of claim 1, further comprising:

(c) separating solids from the alkaline solution.

3. The process of claim 1 or claim 2, further comprising:

(d) separating dissolved silicates from the alkaline solution.

4. The process of claim 2, further comprising:

(d1) precipitating dissolved silicates from the alkaline solution to provide precipitated silicates; and

(e) separating the precipitated silicates from the alkaline solution.

5. The process of any one of claims 1 to 4, further comprising collecting, compressing and storing the hydrogen.

6. The process of any one of claims 1 to 5, wherein the alkaline solution in step (a) and/or step (b) has a temperature below 0° C.

7. The process of any one of claims 1 to 6, wherein step (a) comprises providing the alkaline solution by mixing water with hydroxide.

8. The process of any one of claims 1 to 7, wherein excess heat produced during step (a) and/or step (b) is recovered.

9. The process of any one of claims 1 to 8, wherein step (a) comprises providing the alkaline solution by mixing water with (i) one or more of ammonium hydroxide, lithium hydroxide, sodium hydroxide, potassium hydroxide or cesium hydroxide, and (ii) calcium hydroxide.

10. The process of any one of claims 1 to 9, wherein the silicon is microporous silicon or nanoporous silicon.

11. The process of any one of claims 1 to 10, wherein the silicon material is a silicon-containing alloy.

12. The process of any one of claims 1 to 11, wherein following step (b), the hydrogen is stripped of water vapour and/or caustic vapour.

13. The process of any one of claims 4 to 12, wherein step (d1) is performed by adding calcium hydroxide and/or calcium chloride to the alkaline solution.

14. The process of any one of claims 2 to 13, wherein following any one or more of steps (c), (d) or (e), at least a portion of the alkaline solution is re-used in step (b).

15. The process of any one of claims 1 to 14, which is a batch, semi-batch, continuous or semi-continuous process.

16. An apparatus for producing hydrogen, the apparatus comprising:

a caustic dissolution vessel having one or more inlets suitable for introducing water and hydroxide, and an outlet for exiting an alkaline solution;

one or more hydrogen reaction vessels for producing hydrogen having one or more inlets suitable for introducing silicon and the alkaline solution, an outlet for exiting hydrogen produced and an outlet for exiting the alkaline solution, the one or more hydrogen reaction vessels being in fluid communication with the caustic dissolution vessel;

a first solid-liquid separator in fluid communication with the one or more hydrogen reaction vessels for removing unreacted solids present in the alkaline solution received from the one or more hydrogen reaction vessels;

a precipitation vessel in fluid communication with the first solid-liquid separator for precipitating dissolved silicates in the alkaline solution received from the first solid-liquid separator; and

a second solid-liquid separator in fluid communication with the precipitation vessel for separating precipitated silicates from the alkaline solution received from the precipitation vessel.

17. The apparatus of claim 16, wherein the caustic dissolution vessel comprises a cooling jacket and/or one or more cooling members within the vessel..

18. The apparatus of claim 16 or claim 17, wherein the one or more hydrogen reaction vessels comprise a condenser to condense water vapour produced in the one or more hydrogen reaction vessels.

19. The apparatus of any one of claims 16 to 18, wherein the first and second solid-liquid separators are hydrocyclones, filtration devices, centrifugation devices or sedimentation tanks.

20. The apparatus of any one of claims 16 to 19, further comprising a conduit between the second solid-liquid separator and the caustic dissolution vessel for transporting caustic solution back to the caustic dissolution vessel.