to have preferred spin direction by the interaction with optically pumped alkali. With large cells and certain coatings, Xenon spin can have a lifetime well over 100 seconds. While paraffin may not have been studied extensively with respect to nuclear spin lifetime, there is reason to believe that both paraffin and parylene may be effective for nuclear spins as well. While nuclear spin lifetime is of primary importance, an improvement in the electron (or atomic) spins would be beneficial in both gyro and clock applications.

Filling and sealing is done in a controlled atmosphere, such as in a glove box. The inside of the glove box is heated to a temperature above the melting point of the alkali metal. Rubidium, for example, has a melting temperature of about 38.5 degrees C. An aliquot of liquid metal is then pipetted into each cell via the fill hole. Of course, to ensure that the liquid metal pipettes properly, the cell, the pipette, and the source of alkali metal should all be maintained at or above the alkali metal's melting temperature. The atmosphere in the glove box contains other gaseous components as required for the operation of the gyro or clock. Then a film of parylene on a stretch frame is placed over the array of cells in the wafer and brought into contact with the cells. A circular melt zone is then created around the fill hole. This could be automated with a step and repeat table in the glove box. To create the circular melt zone, a tiny shaped, temperature-controlled "iron" could be used, or a controlled power laser, such as a CO_2 laser could be programmed to scan a circular path to melt the parylene.

Obviously, the sequence could be modified to dice before filling and sealing and do filling and sealing at the chip level if precautions are taken not to contaminate the cells during dicing. The parylene can be removed from the top and bottom of the wafer by plasma etch.

It may be worth noting that the fill hole **501** may be located other than the center of the chip and the relative height and width of the cell may be various to optimize NMR gyro performance. Further, the interior of the cell may not be square, but could be round or any other shape that would optimize NMR gyro performance.

Since it is necessary to control the temperature of the cell **500** very roughly at 100 degrees C., a heater (**701**, in FIG. **7**) may be added to the cell **500**. This can be done by standard lithography and deposition (e-beam, sputtering) methods. In the gyro assembly, the cell will be suspended in a vacuum to minimize gyro power. By judicious placement of the heaters **701**, a gradient can be established within the cell **500** such that the areas that must be transparent are the hottest, so that in operation, excess alkali metal does not deposit in these areas.

FIG. **8** illustrates how a cold spot can be insured by thinning a portion of the cover **602** to decrease lateral heat flow, and placing or depositing a high emissivity coating **801** at the center of the thinned area **802**. The heater would be placed on the opposite silicon surface. Note that the sealing area and cold spot could be combined.

The steps or operations described herein are just exemplary. There may be many variations to these steps or operations without departing from the spirit of the invention. For instance, the steps may be performed in a differing order, or steps may be added, deleted, or modified.

Although exemplary implementations of the invention have been depicted and described in detail herein, it will be apparent to those skilled in the relevant art that various modifications, additions, substitutions, and the like can be made without departing from the spirit of the invention and these are therefore considered to be within the scope of the invention as defined in the following claims.

What is claimed is:

1. A cell comprising:

an alkali metal; and

a coating of parylene on an interior surface of the cell;

wherein the alkali metal is an optically pumped gaseous phase of an alkali metal.

2. The cell of claim **1**, wherein the coating of parylene is deposited on an interior surface of the cell in a vacuum at room temperature.

3. The cell of claim **1**, wherein the parylene coating minimizes interaction of the excited state of the alkali metal, increases lifetime of the excited state, and minimizes interaction of nuclear spin states with the cell walls.

4. A cell comprising:

an alkali metal; and

a coating of parylene on an interior surface of the cell;

wherein the alkali metal is deposited within the cell by pipetting an aliquot of liquid metal from an alkali metal source into the cell, and wherein the cell, the pipette, and the alkali metal source are all maintained at a temperature at least as great as the melting temperature of the alkali metal.

5. A cell comprising:

an alkali metal; and

a coating of parylene on an interior surface of the cell;

wherein the cell further comprises:

an optically transmissive material having an opening formed therethrough; and

top and bottom covers attached to the optically transmissive material.

6. The cell of claim **5**, wherein the optically transmissive material comprises pyrex.

7. The cell of claim **5**, wherein the top and bottom covers are attached to the optically transmissive material by anodic bonding.

8. The cell of claim **5**, wherein one of the top or bottom covers includes an opening therethrough that serves as a fill hole for the cell.

9. The cell of claim **8**, wherein the fill hole is sealed by placing a film of parylene over the fill hole and creating a melt zone that substantially circumscribes the fill hole.

10. The cell of claim **9**, wherein the melt zone is provided by a temperature controlled iron that melts the parylene film.

11. The cell of claim **9**, wherein the melt zone is provided by a controlled power laser directed to scan a path that substantially circumscribes the fill hole and melts the parylene film.

12. An apparatus comprising:

a cell formed from an optically transmissive material having an opening therethrough;

top and bottom covers attached to the optically transmissive material, one of the top or bottom covers including an opening therethrough that serves as a fill hole for the cell;

an alkali metal deposited within the cell; and

a coating of parylene on an interior surface of the cell;

wherein the alkali metal comprises an optically pumped gaseous phase of an alkali metal, and the parylene coating minimizes interaction of the excited state of the alkali metal, increases lifetime or the excited state, and minimizes interaction of nuclear spin states with the cell walls.

13. The apparatus of claim **12**, wherein the coating of parylene is deposited on an interior surface of the cell in a vacuum at room temperature.