This region is maintained at 180 C. This region is fully illuminated with laser light **40** from above. The uppermost 50 cm of tubing comprise the extension **70** of the polarizing cell **30**. This region is outside the oven **56**, and maintained at room temperature. In this region, the alkali metal vapor diffuses to the walls and condenses **22**. The length of this extension **70** must allow for several diffusion time constants to elapse while the mixture of gas **52** is passing through. A length of 50 cm and diameter of 2.5 cm allows gas velocity of approximately 15-20 cm/sec at pressure of 0.1 atmosphere. Higher flow velocities require a longer presaturation region **66** and extension **70**.

In another embodiment, as shown in FIG. **6**, optimized for higher flow velocities, higher temperatures, and shorter polarization time constants, the alkali metal presaturator **66** is not an extension of the polarizing cell **30**. Rather, the alkali metal presaturator **66** consists of thirty turns of 2.5 cm diameter glass tubing, wound in a helix with 10 cm inner diameter. The tubing has been prepared with ridges to prevent the alkali metal liquid from flowing to the bottom. The exit of the alkali vapor presaturator **66** is connected at the bottom to the entrance opening **36***a* of the polarizing cell **30**. The polarizing cell **30** is 2.5 cm diameter **64** glass tubing, oriented vertically. It is illuminated with laser light **40** through a window **38** from above. The unextended portion **72** of the polarizing cell that is in the oven **56** is 70 cm. The extension **70** of the polarizing cell **30** is a slightly larger diameter **64**, 3.0 cm, and 130 cm in length. This embodiment allows production of polarizable gas with even higher temperatures and shorter polarization time constants. This system could operate optimally at 195 C and 40 cm/s flow rate achieving polarization time constants approaching one-fifth of a second.

We claim:

1. A polarizing apparatus comprising:

a polarizing cell with a length, multiple openings, and a window transparent to laser light for polarizing a gas mixture, at least containing a polarizable nuclear species, at least one alkali metal vapor, and at least one quenching gas, flowing through the polarizing cell;

a magnetic field in which the polarizing cell is immersed;

a laser producing light, at the absorption wavelength of the alkali metal vapor, and an optical arrangement to cause the laser light to be substantially circularly polarized; and

a means to propagate the laser light through the transparent window into the polarizing cell for an attenuation length wherein the length of the polarizing cell is substantially greater than the attenuation length.

2. The polarizing apparatus of claim **1** wherein the polarizing cell has an operating gas pressure that is less than two atmospheres but greater than a pressure required to efficiently quench an alkali optical pumping using a combination of at least 2 torr of a polarizable nuclear species and a minimum pressure of quenching gas, of at least 60 torr of nitrogen.

3. The polarizing apparatus of claim **1** wherein the window through which the laser light enters the polarizing cell is at a temperature substantially lower than that of the polarizing cell, thereby reducing attenuation of the laser light in an unpolarized alkali metal vapor layer in contact with the window.

4. A polarizing apparatus comprising:

a polarizing cell with a length of at least 90 cm, multiple openings, and a window transparent to laser light for polarizing a gas mixture, at least containing a polarizable nuclear species, at least one alkali metal vapor, and at least one quenching gas, flowing through the polarizing cell;

a magnetic field in which the polarizing cell is immersed;

a laser producing light, at the absorption wavelength of the alkali metal vapor, and an optical arrangement to cause the laser light to be substantially circularly polarized; and

a means to propagate the laser light through the transparent window into the polarizing cell.

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