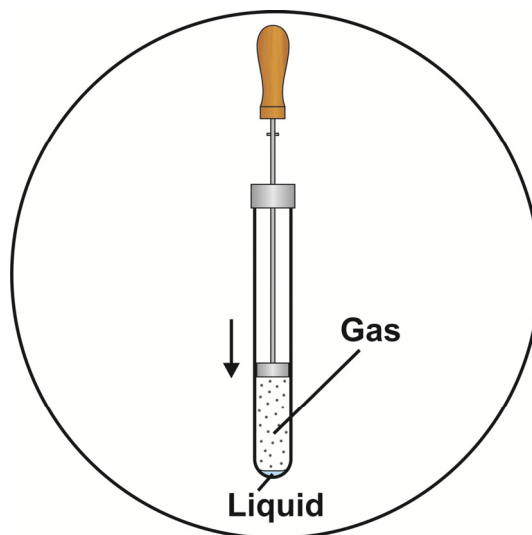


# Using Pressure to Liquefy a Gas

## Equipment:

glass cylinder closed on one side  
(plastic coating as protection against the risk of explosion)  
push rod with piston at the lower end as well as union nut, small bolts and handle at the upper end  
beaker



## Chemicals:

butane (e.g. camping gas cartridge, refill gas for lighters)  
silicone grease  
lukewarm water

## Safety:

butane (C<sub>4</sub>H<sub>10</sub>):



H220 - 280  
P210 - 377 - 381 - 403

Please note the following when filling the glass cylinder: Butane is highly flammable; therefore, all sources of ignition such as open flames, burning cigarettes, etc. should be kept away. Since the gas should not be inhaled, it is highly advisable to work in a fume hood. Contact with the eyes and skin should be avoided; it is therefore necessary to wear safety glasses and protective gloves.

## Procedure:

Preparation: First, the sealing ring in the union nut must be rubbed very thinly with silicone grease. Subsequently, a few mL of liquid gas are carefully injected into the glass cylinder. The butane is then allowed to evaporate (e.g. by immersing the lower part of the cylinder in the lukewarm water in the beaker); the piston is inserted when all the liquid has just evaporated, so that it is ensured that the butane vapor has displaced the residual air that disturbs the experiment from the cylinder. Finally, the piston is put on and the union nut is tightened.

Procedure: The glass cylinder is placed on a soft and nonslip surface and the piston is pressed down using the push rod. Once the piston has been inserted as far as possible, it is locked in place with the aid of the bolts. Subsequently, the lock is released.

## Observation:

When the piston is pressed down, a colorless streaky liquid begins to form on the cylinder wall, which converges to form a drop at the bottom of the cylinder. The volume of liquid continues to increase during further compression. After locking, the final state of liquefaction that has been reached is maintained. If the lock is released again, the piston slides upwards and the drop of liquid slowly disappears.

**Explanation:**

By increasing the pressure, the butane gas is liquefied, it condenses, as this process is also called. If the pressure is reduced again, the butane returns to its initial gaseous state.

**Disposal:**

After completion of the demonstration, the cylinder has to be drained of butane, observing the necessary safety precautions.