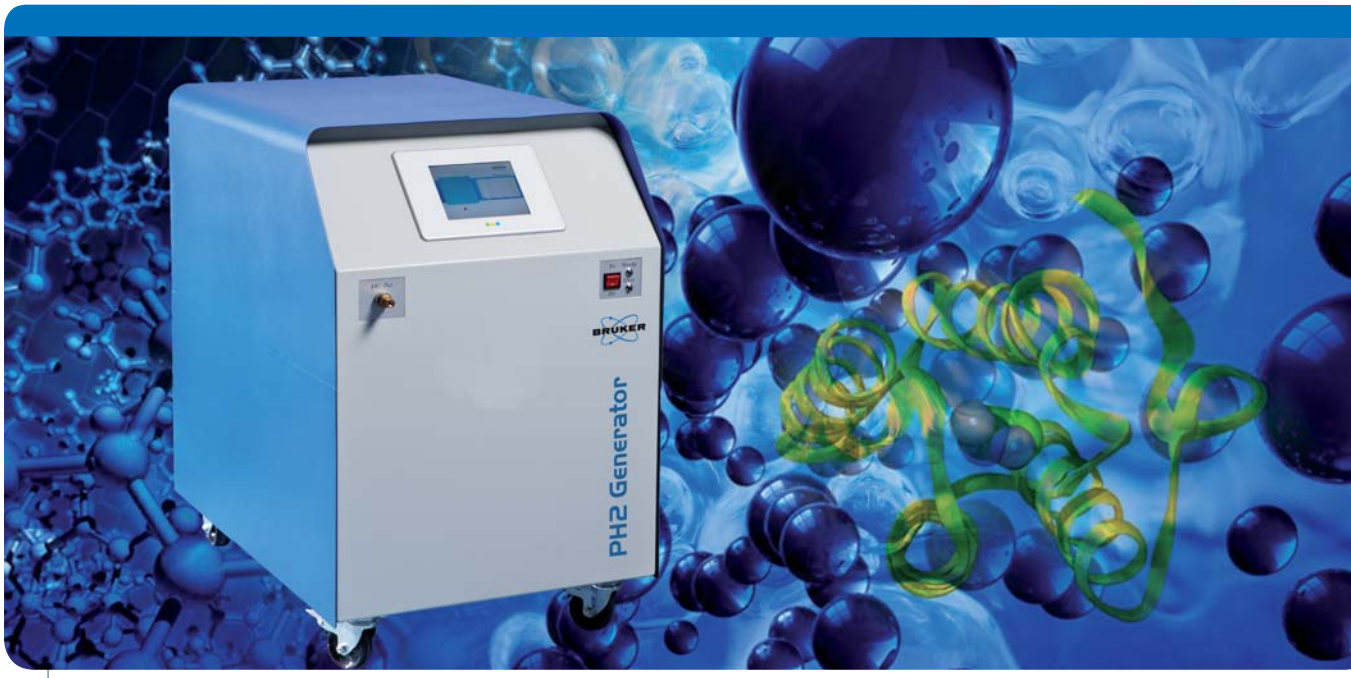


pH2 Generator

Supporting new hyperpolarization research

The pH2 Generator is an instrument designed to enrich the content of parahydrogen of normal hydrogen gas. It is intended to be used for the generation of parahydrogen in a laboratory environment. An example of laboratory use of parahydrogen is for the production of hyperpolarised substrates for NMR spectroscopy or preclinical MRI.

Features

- Stand-alone cryogenic device for the enrichment of the parahydrogen content of hydrogen gas
- Essential equipment for HIP and NH-PHIP hyperpolarisation experiments
- Specially designed for continuous flow operation, crucial for infusion MRI of hyperpolarised molecules
- Fully automatic operation
- Simple installation; no special services such as water cooling required

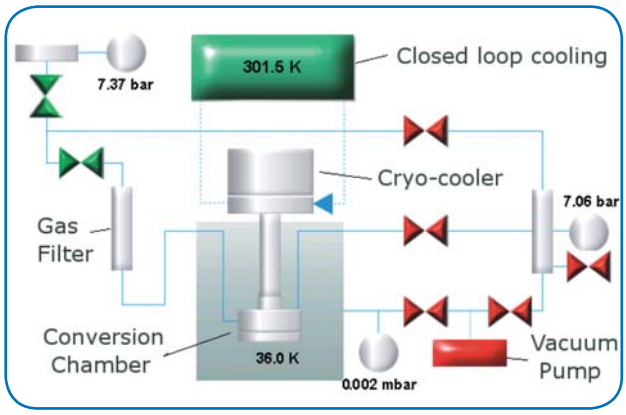
Principle of operation

Conversion of orthohydrogen (oH_2) to parahydrogen (pH_2) can be achieved simply by passing H_2 gas over a catalyst at low temperature. In liquid Nitrogen at 77K this produces ~50% pH_2.

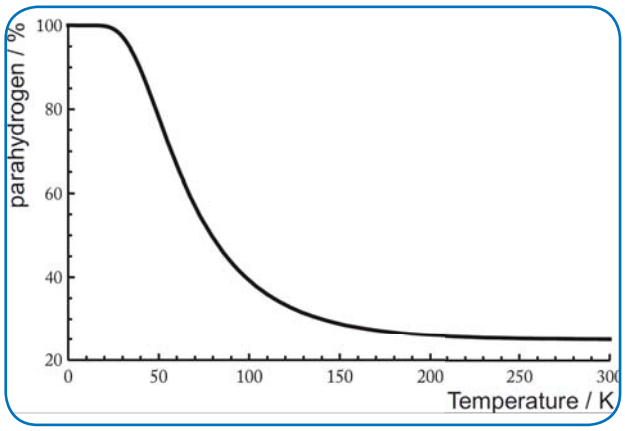
Using a cryocooler at lower temperature a higher yield can be obtained and devices have been described that work at 20K and yield close to 100%. However, 20K is the boiling point of H_2 at room temperature and cooling H_2 at 20K and higher pressure (e.g. 10bar) produces liquid pH_2. This is OK for batch production but not suitable for a continuous steady flow of pH_2 gas. A steady flow is essential for the continuous production of hyperpolarised molecules for infusion MRI.

By adjusting the conversion temperature to be above the boiling point of H_2 at the working pressure of the generator, it is possible to produce a steady flow of pH_2. The pH2 Generator works at ~36K, yielding close to 90% parahydrogen.

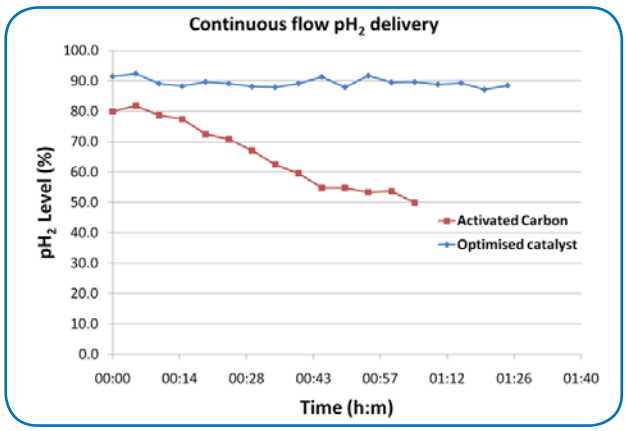
The pH2 Generator integrates into a single metal cabinet the following components: a valve controlled gas routing system, a conversion chamber in a vacuum enclosure, a vacuum pump, a cryo-cooler, a closed loop secondary cooling system, and an electronic unit. The instrument is connected to the mains power supply and to a supply of high purity hydrogen gas.



Functional diagram of the pH2 Generator



pH_2 content of H_2 gas vs temperature Variable temperature control



Continuous flow yield measurement