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Temperature Control of a Cryogenic Bath

The problem:

Samples undergoing cryogenic tests are usually cooled to low temperatures in cryogenic baths. Bath temperatures have been commonly reduced by large and expensive vacuum pumps which frequently introduce vibrations that disturb the sensitive measurements.

The solution:

Cryogenic baths may be cooled by introducing a foreign gas into the vapor phase above the liquid region of the bath. Because of this method, the equipment has been simplified to a tank of gas and a cover such as styrofoam.

How it's done:

To further cool the cryogenic bath, a foreign (preferably inert) gas is introduced into the vapor region above the bath liquid. Part of this gas dissolves in the bath and thus lowers its boiling point. As a result, the temperature of the tested sample is reduced by the corresponding increment.

Bath temperature may be measured directly with devices such as a platinum resistor. The lower temperature level observed with this resistor is maintained with a periodic introduction of gas. Any gas with a boiling

point lower than that of the bath liquid may be used to produce additional cooling. Helium is considered the best choice, although the cheaper nitrogen may suffice for temperatures above 100 K.

Note:

Requests for further information may be directed to:
Technology Utilization Officer
NASA Headquarters
Code KT
Washington, D.C. 20546
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No patent action is contemplated by NASA.

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