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Nelium –a Refrigerant with High Potential for the Temperature Range between 27 and 70 K

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In the search for the optimum process for the liquefaction of hydrogen, it was found that mixtures of Helium and Neon, called “Nelium”, allow processes with very high efficiency compared with pure Helium or pure Neon in the temperature range between 27 and 70 K. A mixture with e.g. 75 % Helium and 25 % Neon has a molecular weight of 8 kg/kmol. In contrast to pure helium the ambient temperature compression can be performed with turbo compressors, and a direct recovery of the expansion turbine power is feasible. Compared to pure Neon, the heat transfer is better and the pressure drop is lower. Suitable components for such processes have been identified.

The primary use of this refrigerant is in the gaseous state. But there are also interesting options for the partial separation of Neon and Helium at the cold end, where the Neon-rich liquid could be used for the storage of refrigeration power and later peak shaving, and the Helium-rich gaseous phase could be used to obtain somewhat lower temperatures.

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