

III - 3. Unsaturated superfluid helium. Effect of temperature :

Figures 9, 10, 11, 12 and 13 correspond to superfluid baths with temperatures varying from 1.7 K to 2.1 K but under normal atmospheric pressure.

IV - DISCUSSION OF RESULTS -

All the tests carried out in unsaturated superfluid helium reveal the same characteristics :

Heat transfer occurs according to two distinct rates which lead to the definition of two critical heat fluxes in connection with two different temperature levels. For low power rate, before the first critical heat flux, heat transfer in the superfluid helium occurs without temperature gradient, therefore without mass transfer.

The results of paragraph III - 2 show that whatever the pressure applied the first critical heat flux appears near 3.7 W/cm² (taking in account the channel cross-section) for a bath temperature of 1.85 K.

Similar results were obtained in saturated superfluid helium by Bertmann and Kitchens (2), Passow (3), Chapmann et Al (4) and unsaturated superfluid helium by Linnet and Frederking (5) and Kraft (6).

All these experimentations are made without mass transfer in capillary tubes on channels at temperature near 1.8 K - 1.9 K and the authors find critical heat fluxes of between 1 and 3 W/cm², despite very different experimental geometries, pressures, and methods of heating (localized or distributed).