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DISCUSSION

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The authors' classification of heat transfer regimes in superfluid He II appears to be quite useful when the region of large heat flux densities is considered. It is noted however, that the definition of regime 2 (Fig. 2) may not be generally acceptable in the light of the experiments of reference [5] and others. In other experiments [5] the establishment of several cooling curves in regime 2 (instead of one single function) is less obvious. In this context, it is noted that the present specimen geometry has been adopted also by Efferson.[4] Efferson's results show that the particular combination of specimen materials allows large temperature fluctuations at high heat fluxes. This point deserves attention since in cryogenic technology equipment these conditions appear to be more frequent than perfect temperature uniformity.

The major point of concern in the present paper is the applicability of the Rivers-McFadden model to He II film boiling. It is known that film boiling of subcooled liquids, aside from vapor film properties, is affected by the conditions in the *liquid* (stirring, forced convection, stratification). These effects shift the numercial values of the thermal conductances. Usually, however, the order of magnitude is not altered. Similarly, in film boiling of He II the heat transfer is influenced by the state of the *liquid* (bath temperature, liquid heat path), as demonstrated in Fig. 7 of the paper. In contrast to ordinary subcooled film boiling however, the thermodynamic conditions in the He II have not yet been resolved completely. Therefore, the related thermohydrodynamics has not yet been cast into forms which allow more detailed calculations of the present problem. In view of this state of the art, Rivers and McFadden displayed considerable intuition when they adopted the profiles of Fig. 4 for their integral treatment. As long as the range of validity of these profiles cannot yet be fully assessed, the Rivers-McFadden model gives (as documented in Fig. 10) a remarkable account of film boiling heat transfer in He II.

[3] University of California, Los Angeles, Calif.

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Authors' Closure

The authors would like to thank Dr. Frederking for his comments and for his analysis of the problems associated with film boiling in He II. In considering regime 2 (Fig. 2) two items should be kept in mind. First, Fig. 2 is intended as a qualitative representation and care should be taken in attaching quantitative significance. Second, Goodling and Irey [5] state,

> As noted in Figs. 2 and 3, the experimental data begins to deviate from the Khalatnikov theory at a heat flux on the order of 0.1 W/cm^2 and diverges by as much as 35% in the vicinity of the peak flux. This agrees with the data reported by Holdredge and McFadden [13].

Dr. Frederking's comments substantiate the statement in the text expressing the need for more results to confirm and describe this region.

The test section used by Efferson was somewhat different in that no provision was made to insure minimum thermal contact with the ends of the test section by way of the thermometer leads. Also, in using test sections of this design a match of thermal expansion between the film and glass is important. Helium I data were taken with the test sections used in this investigation, and the results[5] do not show the fluctuation noted by Efferson. However, Dr. Frederking's comments concerning the need for investigation in material combinations where large temperature fluctuations occur at high heat fluxes does point out a problem area.

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