



Figure 10 Effect of pipe flow,  $R=3.1$ , high flowrate,  $W=25$

No rheological data are available for the foam which travelled through a pipe; this is another area where more work would be useful.

### Conclusions

Relatively straightforward methods can be used to study the bubble size distributions in liquid-gas foams. The results can be related to the measured rheological properties of the foams. In order to obtain consistent results, it is essential to control experimental conditions very closely.

To a first approximation, the slip layer thickness is a function of expansion ratio only, and independent of average bubble size. The yield stress depends on both expansion ratio and average bubble size, and is a minimum at expansion ratios around 4 and for small average bubble size.

## Book review

### High Temperature Heat Exchangers

Eds Y. Mori, A. E. Sheindin and N. Afgan

This book is a collection of forty-five papers from the XVII Symposium of the International Center for Heat and Mass Transfer on High Temperature Heat Exchangers, held in Dubrovnik, Yugoslavia in August 1985. The book is structured into four sections: (1) High temperature heat exchangers development, (2) Basic problem in high temperature heat exchangers, (3) Heat exchangers for high temperature recovery, and (4) High temperature heat exchangers for future power plants and industrial process applications. Each section contains one keynote paper which overviews the subject. Two additional summary papers are included, one on high temperature reactors and one on energy recovery programs in the Economic Commission for Europe (ECE).

Being a collection of symposium papers, the book is not organized by topic to facilitate quick location of the valuable content of the papers. Included in the text are three papers on convective heat-transfer augmentation, four papers on radiative heat-transfer augmentation, one on temperature dependence of fluids, 21 papers on performance modelling, and seven papers describing processes and plant systems.

Both regenerative (including packed beds) and recuperative types of heat exchangers are modelled in some analytical treatment in a total of 21 papers. Design information, presented in 17 papers for regenerative types and 14 papers for recuperative types, includes convective performance, radiation

If a continuous method of measuring bubble size distributions were developed, it should be possible to improve the observed correlations considerably. It might also then be feasible to work backwards and develop a foam generating system to produce a foam with some desired rheology.

Foam is modified by flowing through a length of rough pipe. Further work is needed to clarify the effects of both bubble size distribution and rheology.

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The work described was carried out in the Mechanical Engineering Department of the University of Southampton, under a grant from the Science and Engineering Research Council. The foam generator was loaned by the Department of the Environment, Fire Research Station. Access to the Quantimet and Zeiss TGZ3 machines was provided by the Central Electricity Generating Board, Marchwood Engineering Laboratories.

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effects, and techniques to accommodate thermal strain. Materials for high temperatures are discussed in seven papers.

Specific applications describe in this book for high-temperature heat exchange include energy conservation in process industries, high temperature nuclear reactors, nuclear gasification of lignite or hard coal, and magnetohydrodynamic systems. One novel system described in this text recovers heat from molten slag at 1500°C. Hot slag is normally dumped into a cooling yard and left to warm the atmosphere.

All but three of the papers in this volume were contributed by non-USA authors, mostly from Japan, Germany, and the USSR. Because of the many different topics covered and lack of focus, this volume would be valuable only to those individuals involved in specific high-temperature heat exchange. However, the valuable information warrants that this book should be available in technical libraries.

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