

DISCUSSION

*K. D. Challenger*¹—Did the cold worked aluminum specimens recrystallize during the post helium implantation anneal at 500 and 600°C? If so, the loss of helium would seem to be better explained by the motion of grain boundaries rather than an effect of high dislocation density.

F. A. Smidt, Jr. and A. G. Pieper (authors' closure)—Specimen A1-1, which was the cold-worked specimen that showed losses of helium during annealing, was recrystallized at least after the 600°C anneal. It is probable that grain boundary motion was responsible for some of the transport of helium during annealing; and, in fact, some grain boundaries had very large bubbles attached to them. There were, however, many bubbles still in the grain interiors, and the dislocation density within the grains was still quite high, a condition which would not be typical of an aluminum specimen annealed at 600°C.

*Che-Yu Li*²—We wish to comment that Gruber's bubble calculation does not include the effects of bubble-dislocation interaction. The surface diffusion coefficient calculated by the authors may be affected by the above effects. There are bubble models that account for bubble dislocation interaction effects.

F. A. Smidt, Jr. and A. G. Pieper—The authors are well aware of the fact that Gruber's model does not include the effects of bubble dislocation interactions and that the presence of dislocations would perturb the growth kinetics and yield erroneous values for surface diffusion coefficients. Most of the data used to test the models were from relatively low dislocation density materials. The cases where it was suspected that a high dislocation density might have yielded erroneous points were noted in the text as Specimen A1-5 (at 582°C), Specimen SS-6 (900°C), and Specimen SS-7 (1000°C). All these specimens did give points above the lines. Specimen A1-1, which was the cold-worked specimen that lost helium during annealing, was not used in the analysis. Specimen A1-2, which was also cold worked prior to irradiation, had very few dislocations in the final structure and had smaller bubble sizes than would be predicted from the Gruber model. It is suspected that this specimen, which was part of a beam stop, overheated during implantation and the scale of nucleation and subsequent bubble size was influenced by helium enhanced void nucleation.

¹ Breeder Reactor Operation, General Electric Company, Sunnyvale, Calif. 94086.

² Professor, Department of Materials Science and Engineering, Cornell University, Ithaca, N. Y. 14850.