

DISCUSSION

*J. M. Krafft*¹ (*written discussion*)—The extraordinary drop in K_Q values for the smaller, and thus thinner specimens of high-strength titanium, Fig. 10, is indeed puzzling. Is it possible that this alloy is susceptible to subcritical crack growth, such as stress corrosion cracking, in room air moisture? If so it would be possible that a given subcritical growth rate would have a larger relative effect on the crack opening displacement of the smaller specimens, and thus depress their indication of K_Q . This could be checked with a sustained load in one of the larger specimens, in room air at a K_I level of say 20 or 30 ksi $\sqrt{\text{in.}}$, representative of the lower values of Fig. 10.

M. J. May (*author's closure*) and *E. F. Walker*²—We would agree that the reason for the rapid decrease in apparent valid K_{Ic} values for the high-strength titanium alloy is of concern and difficult to explain. As stated the influence of a given increment of crack extension due to stress corrosion would result in a larger displacement in the smaller specimen due to a greater influence on a/W . However, in order to account for the difference between specimens 0.1 and 0.5 in. thick, having K_{Ic} values of 20 ksi $\sqrt{\text{in.}}$ and 40 to 50 ksi $\sqrt{\text{in.}}$ in these terms would necessitate considerable crack extension. No evidence of stress corrosion cracking has been observed in this material under normal testing conditions. Even if one takes the fracture load of the smaller specimen and corrects for prior crack extension the maximum applied stress intensity is still less than the critical stress intensity, K_{Ic} , determined from larger specimens.

This type of behavior also has been observed in other high-strength materials and is thought to arise from test situations where there is an abrupt change from essentially elastic to largely plastic behavior, that is, a sudden loss of plane strain conditions due to through thickness yielding. This is highlighted by a marked difference in the characteristics of the load-displacement records with change in specimen size.

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