Reply to 'Comment on "Craze growth and craze interactions"'

I should make the following points of clarification.

1. When I stated that the Verheulpen-Heymans–Bauwens model was incompatiable with the Argon–Salama model, it was only in the sense that the former postulates two levels of stress within the craze, and the latter a single stress level in the craze and a conventional yielded zone ahead of it. Mathematically they are both derived from the Dugdale [1] model, and they differ by ascribing time dependent micromechanisms to the craze body, and to the yielded zone ahead of the craze, respectively. The model which I developed was less concerned with the micromechanisms than the need to analyse the growth of multiple crazes and curved crazes.

2. Any introduction of a time dependent micromechanism into a linear elastic model produces an empirical model that needs to be validated in every situation in which it is used. It may well be that, as Verheulpen-Heymans states, the rate controlling step in polycarbonate is the drawing of material into the body of the craze, whereas in polystyrene it is the propagation of the craze tip. A more complete kinetic model, embodying both micromechanisms, would seem to be needed. I agree that the magnitude of the potential energy release rates that I calculated will depend on the assumptions made about the stress distribution in the craze. Nevertheless the relative changes in potential energy release rate as two or more crazes grow and interact should be unaffected, and therefore the results should be useful in explaining craze interactions.

3. I did not "question the validity of a two-dimensional analysis" of craze growth. However it is important to realize that crazes are three dimensional objects, and that the increase of the surface length of crazes with time may not have the same kinetics as the increase of their penetration from the free surface. Most elastic analyses of crazes are two-dimensional, and care must be taken in applying them to situations where the craze shape may change with time.

References

1. D. S. DUGDALE *J. Mech. Phys. Sol.* 8 (1960) 100.

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