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# RATE-DEPENDENT DAMAGE-PLASTICITY MODEL FOR FILLED ADHESIVE THERMOSETS

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Thermosetting polymers, such as filled epoxy and vinylester resins, are widely employed as adhesives in structural applications due to their ease of use, flexible installation, and fast curing times. However, contrasting to this simplicity, these materials exhibit complex inelastic phenomena, such as rate-dependent plasticity, potentially with softening and/or hardening, damage, and cure-dependent shrinkage, among others.

To address such difficulties, different modeling strategies are employed by different authors. However, many models offer tight fits for some load cases, particularly uniaxial loads at constant speeds, but fail to capture important phenomena such as multiaxial stress states and/or variable loading rates. Others, on the other hand, require a large number of parameters, sometimes impractical to obtain. This work aims at addressing such issues by providing a general damage-plasticity formulation with predictive capabilities at different loading speeds and stress states that can be fitted with a limited number of simple experiments. Similar strategies can be seen for the case of polypropylene-based polymers in Pulungan *et al.* (2018), on which this model expands open, and for concrete in Grassl *et al.* (2013), from which it draws inspiration.

The model is fitted to tensile dog-bone specimens at different loading rates, as well as compressive cylinder and compact-tension tests. It is then used to recover load-displacement curves and failure patterns for other, more complex mixed-mode tests, such as three-point-bending and Iosipescu shear tests. Great predictive quality can be seen, even with a limited set of characterization experiments and fit parameters. The model also addresses demonstrable issues with approaches suggested by other authors.

## REFERENCES

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