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Finite Element Calculations Using a New Constitutive Model for the Chemical Aging of Rubber JOANNE BUDZIEN, DAVID LO, JOHN G. CURRO, Sandia National Laboratories, DANA ROTTACH, University of New Mexico — We have developed a constitutive model for rubber networks undergoing simultaneous crosslinking and scission reactions. This model is a modification of the independent network hypothesis that includes the coupling between strain history and chemical reactions. This coupling occurs because formation of networks in the strained state is greatly affected by the networks that were already present. Even when early networks scission, the overall material response shows some memory of the initial networks (i.e., some later stage networks act as earlier stage networks). We account for this effect using stress transfer functions. The model has been tested on microscopic molecular dynamics simulations. We will present results using this constitutive model in finite element calculations showing the large effect that the coupling of strain history and chemical reaction has.

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