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(54) **HYDROLYZABLE, ENERGETIC THERMOPLASTIC ELASTOMERS AND METHODS OF PREPARATION THEREOF**

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(56) **References Cited**

U.S. PATENT DOCUMENTS

4,806,613 A * 2/1989 Wardle 528/59

5,436,313 A 7/1995 Klang et al.
5,436,314 A 7/1995 Yang et al.
5,665,822 A 9/1997 Bitler et al.
5,747,603 A 5/1998 Hinshaw et al.
5,783,302 A 7/1998 Bitler et al.

* cited by examiner

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(57) **ABSTRACT**

The present invention provides energetic thermoplastic elastomers which may be used as binders in propellant, explosive and pyrotechnic applications. The elastomers of the present invention are all hydrolyzable, allowing recycling of the elastomer's constituents and/or facilitating other constituents of the propellant, explosive or pyrotechnic. The elastomers of the present invention contain a first polymer, a second polymer having a repeating unit different from that of the first polymer, and a bridging group. Methods of preparing elastomers of the present invention include reaction of the first and second polymers with a dioic acid, or with an organic diisocyanate and a diol containing a formal linkage.

23 Claims, No Drawings