Dynamic Cross-Linking of Polyethylene via Sextupole Hydrogen Bonding Array

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Multiple hydrogen bonding motifs are promising tools for polymer functionalization to obtain adaptable networks combining advantages of permanent cross-linked systems with processability of thermoplastics. We describe the use of a new multiple hydrogen bonding motif to impart increased tensile strength, stiffness, melt strength, barrier properties and a plateau modulus after melting to functional polyolefins, while retaining adaptability of the polymer network. The cross-linked nature of these polymers was elucidated by thermal and mechanical analysis, revealing a raised glass transition and rheology similar to permanently cross-linked polymer matrices. The apolar polymer matrix was found to stabilize the new hydrogen bonding motif at elevated temperatures. The resulting polymer showed thermal resistance superior to ureidopyrimidone (UPY) motif functionalized materials, the most commonly employed synthetic multiple hydrogen bonding motif to date.

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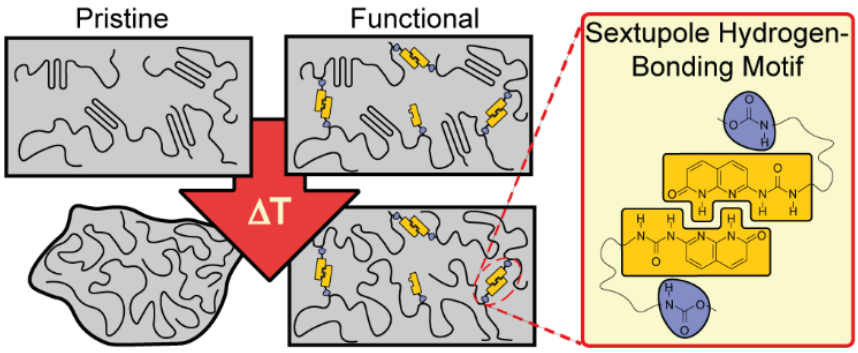

Figure 1. TOC graphic illustrating the increased melt strength as a result of functionalization with sextupole hydrogen-bonding motif