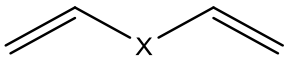
thereby causing gelling and reactor fouling. The reincorporation mechanism does not produce much branching, and branching can only occur after the polymer strand is produced, thereby further limiting the amount of branching that can occur.

SUMMARY

[0006] ~~Embodiments of t~~This disclosure ~~include~~ provides for polymers comprising the polymerized product of ethylene, at least one diene comonomer, and optionally at least one C_3 to C_{14} comonomer. The polymer comprises tri-functional long-chain branches resulting from the diene that occur at a frequency of at least 0.03 per 1000 carbon atoms of the polymer.

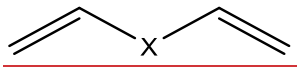
[0007] The diene has a structure according to formula (I):



(I)

[0008] In formula (I), X is CR_2, SiR_2 or GeR_2, wherein each R is independently C_1–C_{12} hydrocarbyl or –H. In some embodiments, X in formula (I) is $-C(R)_2-$, and wherein each R is −H. In other embodiments, X in formula (I) is $-Si(R)_2-$, and wherein each R is C_1–C_{12} alkyl.

[0008a] In one aspect, there is provided a polymer comprising the polymerized product of ethylene, at least one diene comonomer, and optionally at least one C_3 to C_{14} comonomer, wherein: the diene has a structure according to formula (I):



(I)

where X is CR_2, SiR_2 or GeR_2, wherein each R is independently C_1–C_{12} hydrocarbyl or −H; and the polymer comprises tri-functional long-chain branches resulting from the diene that occur at a frequency of at least 0.03 per 1000 carbon atoms of the polymer.

[0009] Various ~~embodiments~~ examples of the process include polymerizations that occur in a solution polymerization reactor or a particle forming polymerization reactor such as a slurry reactor or a gas phase reactor, wherein the molecular or solid-supported catalyst is delivered to the reaction media or developed in the reaction media, wherein the reactor system is batch or continuous or a hybrid such as semi-batch, wherein the reactor residence time distribution is

narrow such as in non-backmixed reactors or broad such as in backmixed reactor and series and recycle reactors.

BRIEF DESCRIPTION OF FIGURES

[0010] FIG. 1 is a graphical depiction of the molecular weight of a polymer as the number of branching methines per 1000 carbons.

[0011] FIG. 2A is a plot of molecular weight increase versus diene linkages.

[0012] FIG. 2B is a plot of polydispersity vs. dienes linkages.