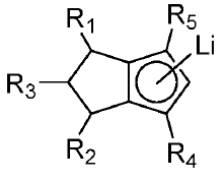
What is claimed is:

1. A method of making an alkylated metallocene having one or more tetrahydropentalenyl groups, the method comprising:

reacting a chloride compound with a lithium compound to make a reaction mixture comprising an intermediate dichloride compound; and

reacting the intermediate dichloride compound with an alkylating agent to make the alkylated metallocene having one or more tetrahydropentalenyl groups, wherein the dichloride compound is not isolated from the reaction mixture, wherein the lithium compound is represented by:



,

wherein R_1, R_2, R_3, R_4, and R_5 are each independently H or a (C1-C4) alkyl.

2. The method of claim 1, wherein reacting the chloride compound with the lithium compound to make the reaction mixture comprising the intermediate dichloride compound occurs in absence of the alkylating agent.

3. The method of claim 1, wherein the chloride compound includes 3 or 4 chlorine atoms.

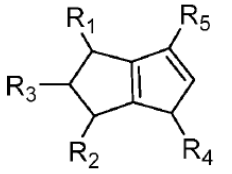
4. The method of claim 1, wherein the chloride compound is selected from zirconium (IV) chloride and n-(propylcyclopentadienyl)hafniumtrichloride (dimethoxyethane).

5. The method of claim 1, wherein the intermediate dichloride compound includes one or more tetrahydropentalenyl groups

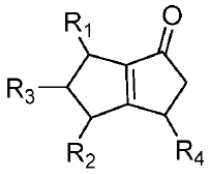
6. The method of claim 1, wherein the alkylating agent is an alkylmagnesium halide.

7. The method of claim 1, wherein

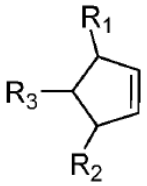
the lithium compound is made by reacting butyl lithium with a bicyclic alkene compound represented by:



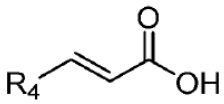
8. The method of claim 7, wherein the bicyclic alkene compound is made by reacting a bicyclic ketone compound with an alkylating agent and diethyl ether to form a bicyclic alcohol compound and dehydrating the bicyclic alcohol compound to make the bicyclic alkene compound, wherein the bicyclic ketone compound is represented by:



9. The method of claim 8, wherein the bicyclic ketone compound is made by reacting a cyclic alkene compound represented by:



with an acid compound represented by:



in the presence of a polar aprotic or dipolar aprotic solvent and an effective amount of a phosphoric and/or sulfonic acid reagent and under reaction conditions sufficient to make the bicyclic ketone compound.

10. The method of claim 9, wherein the solvent has a relative polarity above 0.099 and below 0.444, with the proviso that the solvent is not a cyclic ether.

11. The method of claim 9, wherein the phosphoric and/or sulfonic acid reagent is a P_2O_5/H_3CSO_3H mixture.