METHODS FOR PREPARING CATALYST PRECURSOR MATERIALS

BACKGROUND

Field

[0001] The present specification generally relates to methods for preparing catalyst precursor materials from dihalo-substituted metalloids. In particular, the present specification is directed to methods for preparing catalyst precursor materials from a dihalo-substituted-group-14 metalloid, a halogenated alkane, an organolithium reagent, and a solvent in a continuous addition reaction.

Technical Background

[0002] Linear low-density ethylene-based polymers are designed and increasingly being used to meet the growing demand for packaging, hygiene, and medical products. Dihalo-substituted metalloids may be used to form reaction catalysts that produce linear low density ethylene-based polymer resins. However, the solutions used to produce these dihalo-substituted metalloids are prone to disassociation even at mild conditions, which makes them difficult and costly to produce.

[0003] Current methods for preparing these catalyst precursor materials from dihalo-substituted metalloids require batch reactions, which are thermally unstable and leading to purity variations from batch to batch. Accordingly, alternative methods for producing these catalyst precursor materials are needed. For instance, processes that can increase output and easily and consistently control the temperature of the reactants that form dihalo-substituted metalloids are desired.

SUMMARY

[0004] There is provided a method which includes mixing a first solution comprising a halogenated alkane, at least one solvent, and a first component selected from one of a dihalo-substituted-group-14 metalloid or an organolithium reagent in a first reaction zone; continuously adding the first solution to a second reaction zone; continuously adding a second solution to the second reaction zone, the second solution comprising at least one solvent and a second component selected from one of the dihalo-substituted-group-14 metalloid or the organolithium reagent, wherein the second component is different from the first component; and mixing the first solution and the second solution in the second reaction zone.

[0005] In one aspect, there is provided a method, comprising reacting an organolithium reagent, a halogenated alkane, and at least one solvent in a first reaction zone to form a first solution;

continuously adding the first solution and a second solution to a second reaction zone, wherein the second solution comprises a dihalo-substituted-group-14 metalloid and at least one solvent; and mixing the first solution and the second solution in the second reaction zone.

[0006] Additional features and advantages will be set forth in the detailed description which follows, and in part will be readily apparent to those skilled in the art from that description or recognized by practicing the examples described herein, including the detailed description that follows, the claims, as well as the appended drawings.

[0007] It is to be understood that both the foregoing general description and the following detailed description describe various examples and are intended to provide an overview or framework for understanding the nature and character of the claimed subject matter. The accompanying drawings are included to provide a further understanding of the various examples, and are incorporated into and constitute a part of this specification. The drawings illustrate the various examples described herein, and together with the description serve to explain the principles and operations of the claimed subject matter.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] FIG. 1 schematically depicts a system for preparing catalyst precursor materials according to one or more embodiments disclosed and described herein;

[0009] FIG. 2 schematically depicts an alternative system for preparing catalyst precursor materials according to one or more embodiments disclosed and described herein; and

[0010] FIG. 3 depicts a gas chromatography (GC) spectrum of a catalyst precursor materials produced according to one or more embodiments disclosed and described herein.

DETAILED DESCRIPTION

[0011] Reference will now be made in detail to embodiments of methods for preparing catalyst precursor materials from dihalo-substituted metalloids. Whenever possible, the same reference numerals will be used throughout the drawings to refer to the same or like parts.

[0012] As used herein, the term “metalloid” refers to a chemical element having properties in between, or that are a mixture of, the properties of metals and nonmetals.

Claims

1. A method, comprising:

reacting an organolithium reagent, a halogenated alkane, and at least one solvent in a first reaction zone to form a first solution;

continuously adding the first solution and a second solution to a second reaction zone, wherein the second solution comprises a dihalo-substituted-group-14 metalloid and at least one solvent; and

mixing the first solution and the second solution in the second reaction zone.

2. The method of claim 1, further comprising separately cooling the organolithium reagent and the halogenated alkane of the first solution to a temperature from 0 °C to -90 °C before continuously adding the first solution to the first reaction zone.

3. The method of claims 1 or 2, wherein the dihalo-substituted-group-14 metalloid comprises dichlorodiisopropylsilane, di-tert-butyldichlorosilane, dichlorodiphenylsilane, dichlorodiisopropylgermane, di-tert-butyldichlorogermane, dichlorodiphenylgermane, or combinations thereof.

4. The method of any of claims 1 to 3, wherein the organolithium reagent comprises *n*-butyllithium, *s*-butyllithium, *t*-butyllithium, methyllithium, or combinations thereof.

5. The method of any of claims 1 to 4, wherein the halogenated alkane comprises a di-halogenated methane.

6. The method of any of claims 1 to 5, wherein the at least one solvent comprises an ethereal solvent, an alkyl solvent, an aromatic solvent, or combinations thereof.

7. The method of any of claims 1 to 6, wherein the first solution is cooled to a temperature from 0 °C to -90 °C before the first solution is continuously added to the second reaction zone.

8. The method of any of claims 1 to 7, wherein at least one of the first reaction zone and the second reaction zone have a temperature from -40 °C to -70 °C.