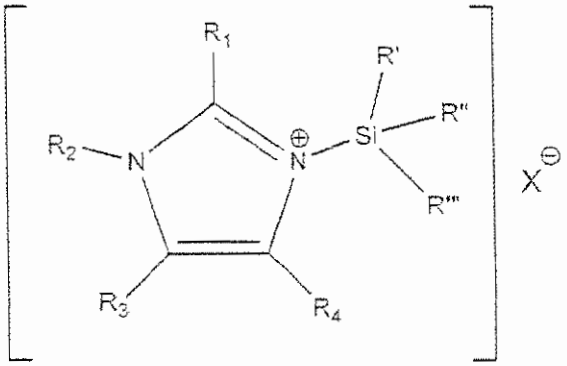
Zarudnitskii, E. V. et al. (*Synthesis* 2006, *8*, 1279-1282) describes a method of synthesizing 1-methyl-3-(trimethylsilyl) imidazolium bromide. However, Zarudnitskii et al. do not teach the use of 1-methyl-3-(trimethylsilyl) imidazolium bromide as a catalyst for epoxy curing applications.

Accordingly, there is a need to develop new latent catalysts for curing epoxy resins at a higher temperature (e.g. greater than 120°C) and are also tunable at various high curing temperatures.

SUMMARY ~~OF THE INVENTION~~

~~One aspect of t~~The present ~~invention~~disclosure is directed to a silylimidazolium salt complex represented by the following Formula I:



Formula I

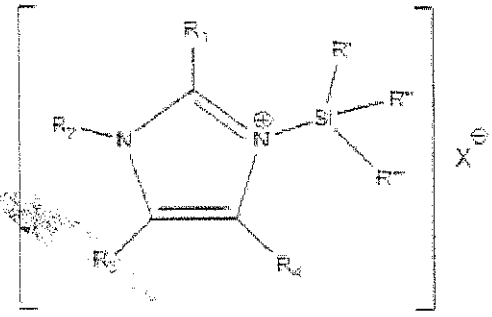
wherein

R_1-R_4 are substituents of the imidazole ring and R_1-R_4 each independently represents an organic group that forms a stable imidazole ring within the silylimidazolium salt complex;

R', R'' and R''' are substituents of the silyl functional group and R', R'', and R''' each independently represents an organic group that forms a stable silyl function group within the silylimidazolium salt complex; and

X^- is an anion which forms a stable salt complex with the silylimidazolium cation within the silyimidazolium salt complex.

In one aspect, there is provided the use of a silylimidazolium salt complex represented by the following Formula I:



Formula I

wherein

R_1, R_3 and R_4 are substituents of the imidazole ring and R_1, R_3 and R_4 each independently represents a hydrogen atom, a substituted or unsubstituted alkyl, a substituted or unsubstituted alkoxy, or a substituted or unsubstituted aryl group that forms a stable imidazole ring within the silylimidazolium salt complex; and wherein R_2 represents a substituted or unsubstituted alkyl, a substituted or unsubstituted alkoxy, or a substituted or unsubstituted aryl group that forms a stable imidazole ring within the silylimidazolium salt complex;

R', R" and R"" are substituents of the silyl functional group and R', R", and R"" each independently represents a substituted or unsubstituted alkyl, a substituted or unsubstituted alkoxy, or a substituted or unsubstituted aryl group that forms a stable silyl function group within the silylimidazolium salt complex; and

X^- is an anion which forms a stable salt complex with the silyiimidazolium cation within the silyimidazolium salt complex wherein the anion X^- comprises a halide, $R\text{-}SO_3^-$, PF_6^-, or BR_4^- and wherein R represents a halide, a substituted or unsubstituted alkyl group, a substituted or unsubstituted alkoxy group, a substituted or unsubstituted aryl group, or CF_3^-,

as a latent catalyst for curing an epoxy resin.

~~Another aspect of t~~The present ~~invention~~disclosure is directed to a tunable latent catalyst comprising at least one silylimidazolium salt complex, wherein the silyiimidazolium salt complex comprises an imidazole ring with a silyl functional group attached to one of nitrogen atoms in the imidazole ring.

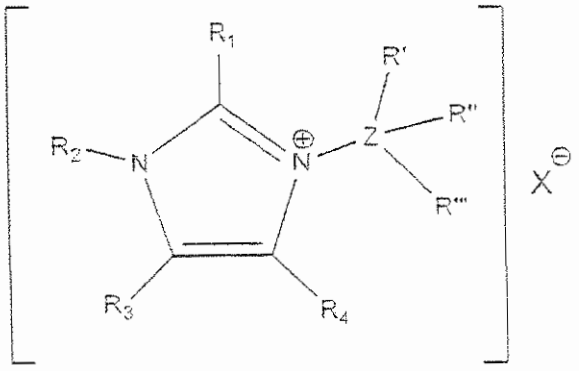
~~Another aspect of the~~The present ~~invention~~disclosure is directed to an epoxy resin composition comprising a) an epoxy resin, b) a curing agent, and c) a catalyst; wherein the catalyst comprises the above silylimidazolium salt complex. In a second aspect, there is provided a thermosettable epoxy resin composition a) an epoxy resin, b) a curing agent, and c) a catalyst; wherein the catalyst comprises the silylimidazolium salt complex as defined herein.

~~Still another aspect of the~~The present ~~invention~~disclosure is directed to an epoxy resin composition comprising a) an epoxy resin, b) a curing agent, and c) a catalyst; wherein the catalyst comprises the above a tunable latent catalyst.

~~Another aspect of t~~The present ~~invention~~disclosure is directed to an article comprising the above thermosettable epoxy resin compositon.

Another aspect of the present disclosure is directed to an article comprising an epoxy resin obtainable by using the thermosettable epoxy resin composition as defined herein.

~~A further aspect of the~~The present disclosure~~invention~~ is directed to an imidazolium salt complex represented by the following Formula II:



Formula II

2. The ~~catalyst~~ use according to claim 1, wherein the catalyst is inert at room temperature and active at a temperature greater than 120°C.

3. The use according to claim 2, wherein the active temperature of the catalyst is from 120°C to 230°C.

4. The use according to claim 3, wherein the active temperature of the catalyst is from 150°C to 230°C.

5. The use according to claim 4, wherein the active temperature of the catalyst is from 180°C to 220°C.

6. A thermosettable epoxy resin composition comprising a) an epoxy resin, b) a curing agent, and c) a catalyst; wherein the catalyst comprises the silylimidazolium salt complex as defined in any one of claims 1 to 5.