1. If, in a reaction, the oxidation number of an atom in a reactant decreases, the atom is said to undergo reduction.

   eg. 1:
   \[
   \text{CH}_2\text{CH}_2\text{Br} + \text{Mg} \rightarrow \text{CH}_2\text{CH}_2\text{MgBr}
   \]

   eg. 2:
   \[
   (\text{CH}_3)_2\text{C} \equiv \text{O} + \text{H}_2 \rightarrow (\text{CH}_3)_2\text{CH} \equiv \text{OH}
   \]

   eg. 3:
   \[
   \text{CH}_4 + \text{Br}_2 \rightarrow \text{CH}_3\text{Br}
   \]

   eg. 4:
   \[
   \text{CH}_3\text{C} \equiv \text{O} + 1. \text{LiAlH}_4 + 2. \text{H}_2\text{O}^+ \rightarrow \text{CH}_3\text{CH}_2\text{OH}
   \]

2. If, in a species subjected to a reaction, the sum of oxidation numbers of atoms that participate in the overall reaction decreases, the species is said to undergo reduction.

   eg. 1:
   \[
   \text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{Br} \rightarrow \text{CH}_3\text{CH} \equiv \text{CHCH}_3 + 2\text{NaBr}
   \]
In 1, the sum of oxidation numbers of atoms that participate in the reaction decreases from 0 to -2; 1 is reduced.

eg. 2:

\[
\text{CH}_3\text{CH}_2\text{CH}_3 + \text{H}_2 \xrightarrow{\text{catalyst: Pd}} \text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_3
\]

In 2, the sum of oxidation numbers of atoms that participate in the reaction decreases from -2 to -4; 2 is reduced.

eg. 3:

\[
\text{CH}_2\text{CH} = \text{CHCH}_3 + \text{H}_2 \xrightarrow{\text{catalyst: Pd}} \text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_3
\]

In 3, the sum of oxidation numbers of atoms that participate in the reaction decreases from -2 to -4; 3 is reduced.

eg. 4:

\[
\text{BrCH}_2\text{CH}_2\text{Br} + \text{Mg} \xrightarrow{} \text{CH}_3\text{CH} = \text{CH}_2 + \text{BrMg}^+\text{Br}^-
\]

In 4, the sum of oxidation numbers of atoms that participate in the reaction decreases from -4 to -6; 4 is reduced.

In most reductions, the species reduced either gains hydrogen (eg. 1 and 3), loses oxygen (eg. 2), or both. Traditionally, in casual usage, a reduction reaction involving neither is not referred to as a reduction.

see also oxidation

Contributors

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