# Reformatsky reaction

| Reformatsky reaction | |
|---|---|
| Named after | Sergey Reformatsky |
| Reaction type | Coupling reaction |
| **Identifiers** | |
| Organic Chemistry Portal | reformatsky-reaction |
| RSC ontology ID | RXNO:0000036 |

The **Reformatsky reaction** (sometimes misspelled **Reformatskii reaction**) is an organic reaction which condenses aldehydes or ketones with α-halo esters using metallic zinc to form β-hydroxy-esters:[1][2]

The organozinc reagent, also called a 'Reformatsky enolate', is prepared by treating an alpha-halo ester with zinc dust. Reformatsky enolates are less reactive than lithium enolates or Grignard reagents and hence nucleophilic addition to the ester group does not occur. The reaction was discovered by Sergey Nikolaevich Reformatsky.

Some reviews have been published.[3][4]

## Contents

## Structure of the reagent

The crystal structures of the THF complexes of the Reformatsky reagents *tert*-butyl bromozincacetate[5] and ethyl bromozincacetate[6] have been determined. Both form cyclic eight-membered dimers in the solid state, but differ in stereochemistry: the eight-membered ring in the ethyl derivative adopts a tub-shaped conformation and has *cis* bromo groups and *cis* THF ligands, whereas in the *tert*-butyl derivative, the ring is in a chair form and the bromo groups and THF ligands are *trans*.

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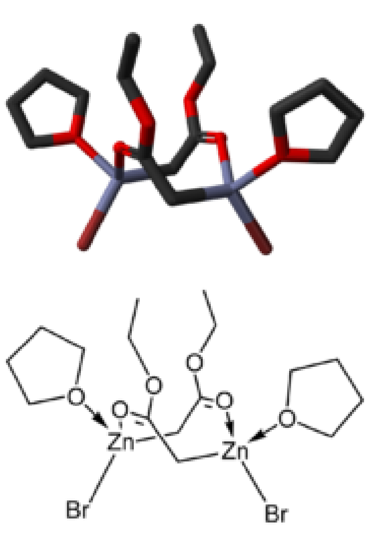
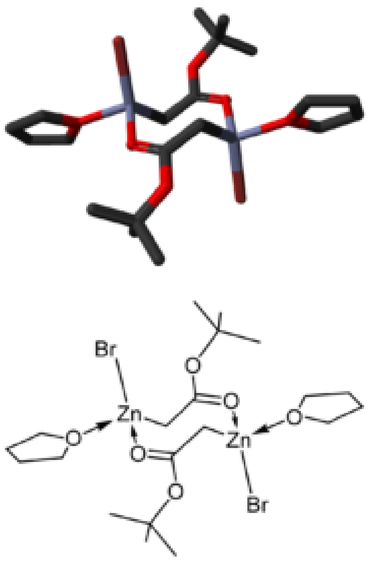
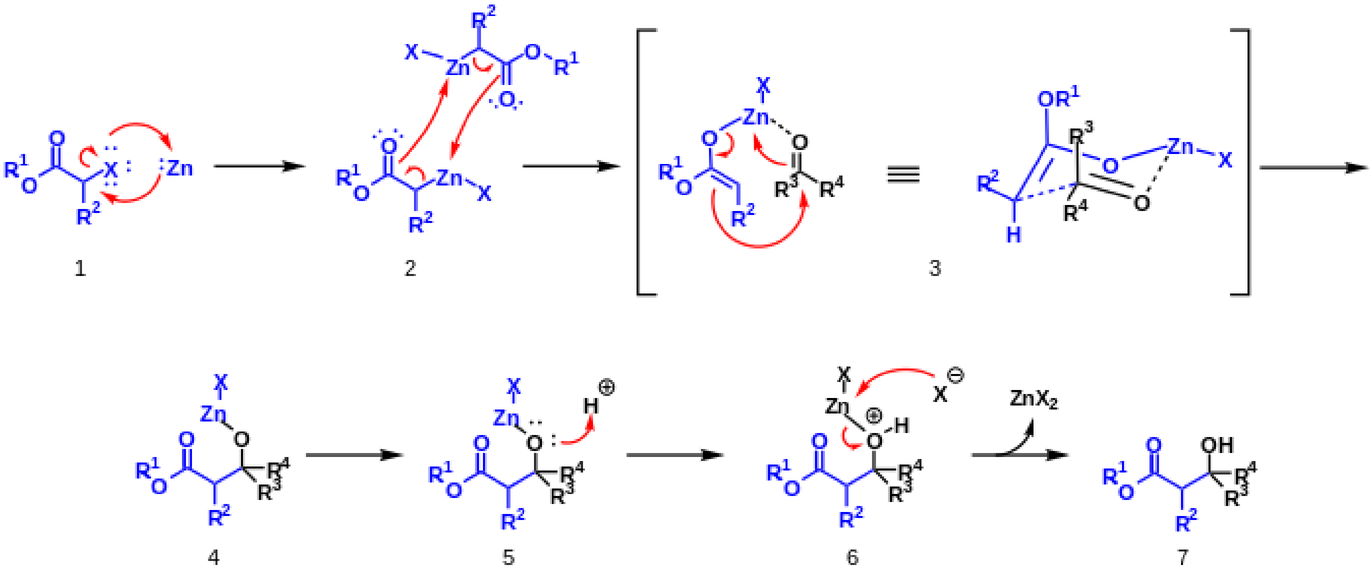
|  |  |
| ethyl bromozincacetate dimer | *tert*-butyl bromozincacetate dimer |

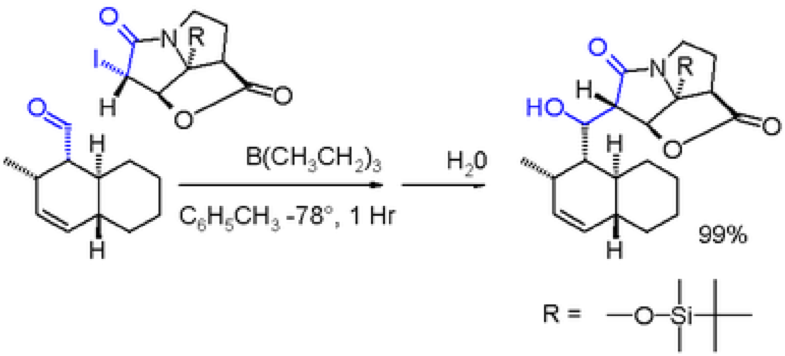
## Reaction mechanism

Zinc metal is inserted into the carbon-halogen bond of the α-haloester by oxidative addition **1**. This compound dimerizes and rearranges to form two zinc enolates **2**. The oxygen on an aldehyde or ketone coordinates to the zinc to form the six-member chair like transition state **3**. A rearrangement occurs in which zinc switches to the aldehyde or ketone oxygen and a carbon-carbon bond is formed **4**. Acid workup **5**,**6** removes zinc to yield zinc(II) salts and a β-hydroxy-ester **7**.[7]



## Variations

In one variation of the Reformatsky reaction[8] an iodolactam is coupled with an aldehyde with triethylborane in toluene at -78 °C.



## See also

- Aldol reaction
- Blaise reaction
- Claisen condensation
- Example use in total synthesis: Mukaiyama Taxol total synthesis (B ring construction)

## References

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