Carbon Homologation / Degradation Reaction means transformation reactions, in which organic compounds such as aldehydes, ketones, or carboxylic acids are converted to the corresponding higher or lower homologs by inserting or removing carbon-carbon chains (i.e. methylene group).

**Homologation Reaction**

\[
\begin{align*}
R' &= \text{-CH}_2^-, \text{-CH}==\text{CH}_2, \text{etc} \\
X &= \text{H, OH, OR''}, \text{etc}
\end{align*}
\]

**Degradation Reaction**

\[
\begin{align*}
R' &= \text{-CH}_2^-, \text{etc} \\
X &= \text{H, etc}
\end{align*}
\]

The reactions are important transformation methods in organic synthesis, thus, a number of procedures have been reported so far. From classical well-known reactions to recent reports, some examples are systematically described as below.

### Aldehydes → One-carbon homologated acetylenes

- **CBr₄** (Carbon Tetrabromide)
  - 25g / 100g / 500g
  - [T0038]

- **PPh₃** (Triphenylphosphine)
  - 25g / 100g / 500g
  - [T0519]

- **Ohira-Bestmann Reagent**
  - 1g / 5g
  - [D3546]

- **Ohira-Bestmann Reagent (10% in Acetonitrile)**
  - 5g / 25g
  - [D5048]

### Corey-Fuchs Alkyne Synthesis

1) **M0828**, n-BuLi
2) aq. HCl

### Wittig Reaction

1) **M0828**, n-BuLi
2) aq. HCl

---

Carbon Homologation / Degradation Reaction

### Aldehydes → Two-carbon homologated aldehydes

![Wittig Reaction](image)

1. D12164, LiOMe
2. THF, 0 °C to 70 °C


### Aldehydes → One-carbon homologated carboxylic esters

![Diethyl (1,3-Dithian-2-yl)phosphonate](image)

5g [D4074]

4-Methylmorpholine

25mL / 500mL [M0370]

4-Methylmorpholine *N*-Oxide

5g / 25g [M2192]

4-Methylmorpholine *N*-Oxide (50% in Water, ca. 4.8mol/L)

25mL / 500mL [M0981]

### Ketones → One-carbon homologated nitriles

![p-Toluenesulfonylmethyl Isocyanide (TosMIC)](image)

5g / 25g [T1046]


### Aldehydes → One-carbon degraded aldehydes

![Diethyl (1,3-Dithian-2-yl)phosphonate](image)

5g [D4074]

D4074 + [nBuLi] THF, -78 °C

Deprotection

R'OH

ROH

T1046 [NaOEt] DME-EtOH, 0 °C

(Y. 85%)
