

# High Quality Branched PEGs (SUNBRIGHT® series)

## Proprietary Branched PEGs

2 arms, 3 arms, 4 arms and newly released 4-Branched XY4-series are now available.

| SUNBRIGHT® GL2-series<br>2-Branched PEG   | SUNBRIGHT® GL3-400X100U<br>3-Branched PEG  |
|---|--|
| $  \begin{array}{l}  \text{X}-\text{O}- \\  \left. \begin{array}{l}   \\   \end{array} \right\} \\  \text{O}(\text{CH}_2\text{CH}_2\text{O})_{n1}\text{CH}_3 \\  \text{O}(\text{CH}_2\text{CH}_2\text{O})_{n1}\text{CH}_3  \end{array}  $ | $  \begin{array}{l}  \text{X}-\text{O}-(\text{CH}_2\text{CH}_2\text{O})_{n2}\text{CH}_2\text{CH}_2\text{CH}_2\text{NHCOO}- \\  \left. \begin{array}{l}   \\   \end{array} \right\} \\  \text{O}(\text{CH}_2\text{CH}_2\text{O})_{n1}\text{CH}_3 \\  \text{O}(\text{CH}_2\text{CH}_2\text{O})_{n1}\text{CH}_3  \end{array}  $ <p><small>*3-Branched PEG can be easily conjugated with inside on binding site.</small></p> |

Newly released !

| SUNBRIGHT® GL4-series<br>4-Branched PEG   | SUNBRIGHT® XY4-series<br>4-Branched PEG  |
|---|--|
| $  \begin{array}{l}  \text{X}-\text{O}- \\  \left. \begin{array}{l}   \\   \\   \\   \end{array} \right\} \\  \text{O}(\text{CH}_2\text{CH}_2\text{O})_{n1} \begin{cases} \text{O}(\text{CH}_2\text{CH}_2\text{O})_{n2}\text{CH}_3 \\ \text{O}(\text{CH}_2\text{CH}_2\text{O})_{n2}\text{CH}_3 \end{cases} \\  \text{O}(\text{CH}_2\text{CH}_2\text{O})_{n1} \begin{cases} \text{O}(\text{CH}_2\text{CH}_2\text{O})_{n2}\text{CH}_3 \\ \text{O}(\text{CH}_2\text{CH}_2\text{O})_{n2}\text{CH}_3 \end{cases}  \end{array}  $ | $  \begin{array}{l}  \text{X}-\text{O}-\text{H}_2\text{C} \\    \\  \text{HC}-\text{O}(\text{CH}_2\text{CH}_2\text{O})_m\text{CH}_3 \\    \\  \text{HC}-\text{O}(\text{CH}_2\text{CH}_2\text{O})_m\text{CH}_3 \\    \\  \text{HC}-\text{O}(\text{CH}_2\text{CH}_2\text{O})_m\text{CH}_3 \\    \\  \text{H}_2\text{C}-\text{O}(\text{CH}_2\text{CH}_2\text{O})_m\text{CH}_3  \end{array}  $ |

Total Mw: 20K, 40K, 60K and 80K  
Amino, Maleimide, Carbonate, Aldehyde, Aminoxy

NOF's IP branched PEGs can lower viscosity of drug solution by increasing number of PEG branch chains through our proprietary technology even their molecular weights are high.

### Viscosity

| Compound       | Structure | Viscosity |
|----------------|-----------|-----------|
| MeO-PEG(40kDa) | Linear    | 19.3      |
| GL2(40kDa)     | 2-arm     | 18.8      |
| GL4(40kDa)     | 4-arm     | 10.9      |

\*as aqueous solution at 10 wt%

pegs

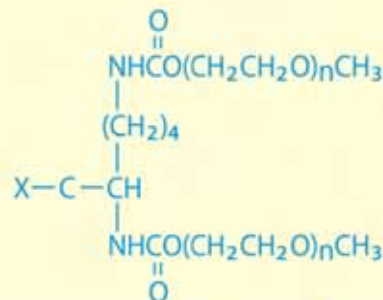
## Lys-base Branched PEGs (SUNBRIGHT® LY-series)

Lysine type branched PEGs with lysine residue in their frame are newly released. These PEGs are licensed products from ENZON Pharmaceuticals.\*

### 2-Branched PEG (SUNBRIGHT® LY-series)

- SUNBRIGHT® LY-400MA (X: Maleimide)
- SUNBRIGHT® LY-400AL3 (X: Aldehyde)
- SUNBRIGHT® LY-400NS (X: NHS-ester)

Total Mw: 40K(20K × 2)



\*ENZON will receive a license fee on actual product sales, as well as exchange contracts prior to commercial sales.

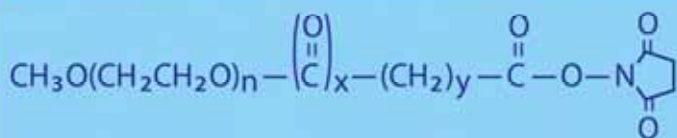
# Activated PEGs for Controlled Release

Reactivity with protein and stability after conjugation can be controlled by adjusting alkyl chain length and linkage of PEG derivatives.

## Carboxylated-PEGs(NHS active esters)

Four types of NHS activated ester-PEGs, which differ in terms of binding forms of carboxylic groups, are on sale.

Reactivity in aqueous solution increases in the following order from the lowest to highest ; HS < GS < CS < AS. After PEGylation, the hydrolysis rate increases in the following order ; HS < AS < GS < CS.

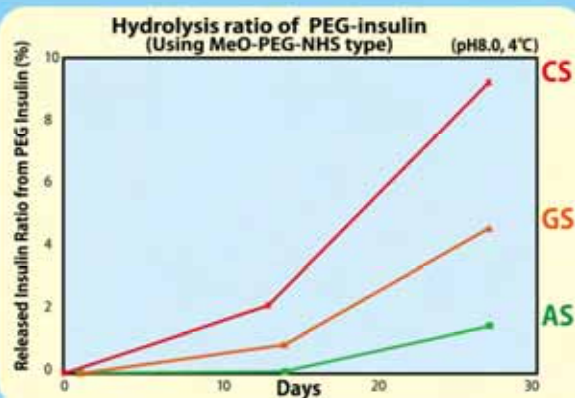


x=0,y=1: SUNBRIGHT®-AS

x=0,y=5: SUNBRIGHT®-HS

x=1,y=2: SUNBRIGHT®-CS

x=1,y=3: SUNBRIGHT®-GS

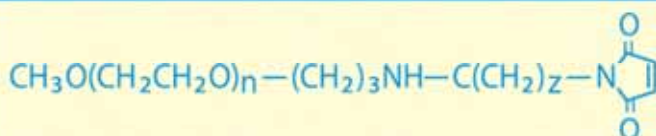


### SUNBRIGHT® Linear PEGs

| Product      | Description             | Molecular Weight                              |
|--------------|-------------------------|---|
| ME-CS series | M-PEG-succinate-NHS     | 2kDa, 5kDa, 10kDa, 20kDa, 30kDa, 40kDa, 60kDa |
| ME-GS series | M-PEG-glutarate-NHS     | 5kDa, 20kDa, 30kDa, 40kDa, 60kDa              |
| ME-AS series | M-PEG-carboxymethyl-NHS | 2kDa, 5kDa                                    |
| ME-HS series | M-PEG-carboxypentyl-NHS | 5kDa, 20kDa, 30kDa, 40kDa                     |

pegs

## Maleimide-PEGs



The Maleimide reactivity and/or stability can be modified by selecting the alkyl chain length between PEG and its linker because of their different hydrophobicity.

z = 2: MA series      z = 5: MA3 series

### SUNBRIGHT® Maleimide PEGs

| Product        | Description                   | Molecular Weight                              |
|----------------|-------------------------------|---|
| ME-MA series   | M-PEG-NHCO-C2-MAL             | 2kDa, 5kDa, 12kDa, 20kDa, 30kDa, 40kDa, 60kDa |
| ME-MA3 series  | M-PEG-NHCO-C5-MAL             | 5kDa, 12kDa, 20kDa, 40kDa                     |
| GL2-MA series  | 2arm-Branched-PEG-NHCO-C2-MAL | 20kDa, 40kDa, 60kDa, 80kDa                    |
| GL2-MA3 series | 2arm-Branched-PEG-NHCO-C5-MAL | 40kDa   |

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