

When molding resin or elastomer, melted resin or elastomer is poured into a mold and molded. When the molded article is demolded from the mold, the molded article may not be smoothly removed from the mold and may break.

In many cases, the molded product can be smoothly peeled off by using various release agents. However, when a release agent other than a fluorine-based compound is used, there are often cases where the resin adheres to the mold, making it impossible to release the mold.

Fluorinated compounds have the lowest surface tension among solid substances. As a result, it exhibits non-adhesiveness and is less likely to adhere to substances such as resins.

| Name of substance       | Surface energy (surface tension) dyn /cm <sup>2</sup> |
|-------------------------|-------------------------------------------------------|
| fluorine compound       | 6 ~ 21                                                |
| silicone oil            | 21~24                                                 |
| paraffin oil            | 24~30                                                 |
| General lubricating oil | 35~37                                                 |
| polyethylene            | 31                                                    |
| Polyvinyl chloride      | 39                                                    |
| polyvinylidene chloride | 40                                                    |

When a fluorine-based compound is applied to a mold for molding, the surface of the mold becomes non-adhesive. As a result, the molded product can be smoothly removed from the mold.

Also, realistically speaking, fluorine-based compounds are much more expensive than other mold release agents, but the reason why fluorine-based compounds are still used is that they cannot be released from molds without fluorine-based compounds. This is a case where the quality is greatly deteriorated.

The table below compares mold releasability when a certain urethane resin is molded.

| compound name                        | Continuous releasability                                        |
|--------------------------------------|-----------------------------------------------------------------|
| Fluorine compound                    | 100 shots or more                                               |
| silicon oil                          | Unable to release [Resin stickiness occurs from the first shot] |
| Commercial oil-based release agent A | Unable to release [Resin stickiness occurs from the first shot] |
| Commercial oil-based release agent B | Unable to release [Resin stickiness occurs from the first shot] |
| Commercial oil-based release agent C | Unable to release [Resin stickiness occurs from the first shot] |
| Commercial oil-based release agent D | Unable to release [Resin stickiness occurs from the first shot] |
| Commercial oil-based release agent E | Unable to release [Resin stickiness occurs from the first shot] |

For these reasons, the fluorine compound is an essential use as a release agent.