

(様式 5)

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## 学位（博士）論文要旨

(Doctoral thesis abstract)

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論文題目 (Title)	Improvement in solubility of the sweetness component “Rebaudioside D” with a focus on multicomponent crystal system 多成分結晶系に着目した甘味成分 Rebaudioside D の溶解性向上
論文要旨 (2000 字程度) (Abstract(400 words))	<p>In recent years, with the increase in sugar intake, the incidence of lifestyle-related diseases, such as, obesity, diabetes, and cardiovascular disorders, has increased worldwide. In 2015, the World Health Organization (WHO) indicated that people should refrain from free-sugar intake. In addition, because of the widespread introduction of sugar taxes, the demand for zero-calorie sweeteners has remarkably increased.</p> <p>Steviol glycosides are found in the leaves of <i>Stevia rebaudiana</i> Bertoni plants and have been used as natural high-intensity sweeteners. Rebaudioside D (RebD) is a steviol glycoside derivative that exhibits a sweetening profile similar to that of sugar but is poorly soluble in water.</p> <p>As a measure to improve solubility at a manufacturing site, dissolution at a high temperature or improvement of dispersibility using a stirring method is applied. However, in the former, the temperature that can be applied is limited from the viewpoint of safety. In the latter, this requires the use of an equipment, and there may be some restrictions in the factories. Therefore, if a highly soluble RebD can be developed, the versatility of RebD will expand, and it will become useful for the industry. In this study, we attempted to improve RebD solubility by controlling crystal structure of RebD by referring to the case of the pharmaceutical industry, which has a long-standing knowledge of solubility with a focus on the crystal structure.</p> <p>The technology aimed at practical application was developed based on the basic strategy of desolvation since the solubility of crystal polymorphs with low hydration tends to be improved in the case of pharmaceutical products. Therefore, in this study, a solvent containing water, or a solvent considered to be the source of solvation, which is generally used to obtain crystals <i>via</i> the crystallization process, was not utilized.</p> <p>We searched for anhydrous RebD crystal polymorphs <i>via</i> drying process. Fortunately, we were able to find two types of novel polymorphs exhibiting improved</p>

solubility. Regarding stability of RebD polymorphs, a substance that is solid at RT was used as a solvent at a high temperature, and a composition in which RebD was dispersed in a solid phase at RT was prepared. By using the new method, we succeeded in creating a stable structure that keeps water away from RebD having sugar-like taste. It was found that the solvent can be utilized not only as a single component but also as a multicomponent.

(英訳) ※和文要旨の場合(400 words)