Seeding Effects on Crystallization Behavior of Cocoa Butter

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The crystallization rates of cocoa butter with and without seeding were measured at 25 and 30°C with a viscometer to examine seeding effects on the solidification kinetics of cocoa butter. Three polymorphic forms of cocoa buffer were used as the seed crystals to examine the influence of polymorphism. We found that the crystallization was greatly accelerated by the addition of the seed powders of Forms III, V, and VI; Form VI was most effective. However, the polymorphic form of the crystallized cocoa butter was primarily set by the temperature of crystallization irrespective of the polymorphism of the seed crystal: Forms IV and V at 25 C, and Forms V and VI at 30 C.

...colate manufacture, the solidification ... significantly influences the quality of ... final products: gloss, snap, texture, heat ...ance, fat bloom resistance, and so on.[1~3] ... most troublesome problems are involved in ... occurrence of different crystal structures of ... fat components, mostly cocoa butter, ... polymorphism.[4~6] The ultimate pur... of controlling the solidification process is ... optimal conditions under which the ... preferable polymorph of cocoa butter ... and can be preserved. The control of ... chocolate solidification on a factory level is ... done by a tempering machine. With ... machine, the molten chocolate (~55 °C) is ... cooled to 25~27 °C, then heated to ... °C at which temperature the chocolate ... for a while. After this process, the ... chocolate is poured into a mold and ... at 5~15 °C over about 20 min. ... is used to complete the solidification ... and to shape the end product. In all ... the solidification occurs through ... nucleation of cocoa butter, pre... leading to nucleation of undersirable ... most of which are metastable. To ... the occurrence of these methastable ... cooling heating procedure using the tempering machine described above is needed.

As another solidification process of chocolate, seeding method has been considered to induce the occurrence of desirable polymorphs. Duck examined the viscosity change of chocolate using small seed crystals of chocolate powder.[7] Giddey and Clerc found that a few triacylglycerols are capable of acting as seed crystals during cocoa butter crystallization.[8] The seed crystals of the stable form of cocoa butter had anti-bloom effects in dark chocolate.[9,10] Adenir and Chaveron measured a cooling curve of dark chocolate with an addition of cocoa butter powder of the stable form.[11] Despite these studies, seeding is not used in factory production. This may be due to difficulties in clarifying the optimal seeding conditions in the chocolate production procedures and also in producing small seed crystals on a factory scale. For the first difficulty, we must solve the following problems: the influences of material, polymorph, amount, and dimensions of the seed crystals on the crystallization rate of chocolate or cocoa butter, the optimal temperature for the seeding, the relationship between the polymorphs of the seed crystal and of the crystallized bulk chocolate, the viscosity changes of chocolate