

Determination of freezing and nonfreezing bound water to κ -carrageenan and microcrystalline cellulose using differential scanning calorimetry

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Spherical beads containing drugs are more important in pharmaceutical use. The manufacturing by wet extrusion/ spheronisation requires special properties of formulations which are realized by addition of κ -carrageenan and microcrystalline cellulose (MCC). The particular rheological characteristics of the formulations were reached by special water binding of these substances. Comprehensive knowledge about the water binding is necessary to understand the bead forming process.

The fraction of freezing bound and nonfreezing bound water was evaluated by a combination of differential scanning calorimetry (DSC) and Karl-Fischer titration. Several DSC curves were recorded depending on different water contents determined by Karl-Fischer measurements. The content of nonfreezing bound water was evaluated from the melt enthalpy. Also referring to the water content the increasing of the melt temperature was used for evaluation of the freezing bound water.

κ -Carrageenan and MCC are able to bind high amounts of water up to more than 80%. The binding capacity of κ -carrageenan for freezing bound water and nonfreezing bound water is higher compared to MCC. Therefore, higher water contents during bead production are required.