The chocolate tempering process

http://ca.wikipedia.org/wiki/Temperament_de_la_xocolata
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Steps in tempering process
- Temperature increase to 44-45°C → melts cocoa butter completely
- Rapid cooling to 27°C → onset of crystallization of different types of crystals
- Slight warming to 32°C → removes crystals that are not type V
Continuous agitation is necessary in all steps

Industrial tempering → different types of tempering machines, companies keep industrial processes secret

Craft tempering → same heating-cooling steps than in industrial tempering

Tempering by seeding → increases speed

Tempering is a fundamental step in chocolate production
The target of tempering process is to obtain the expected features of a good chocolate. It must have a fine structure and a certain hardness to break properly (best snap), must be glossy and melt near body temperature

It controls cocoa butter crystallization

Cocoa butter can crystallize in six different forms: only polymorph V is desirable

<table>
<thead>
<tr>
<th>Polymorph</th>
<th>Melting point</th>
</tr>
</thead>
<tbody>
<tr>
<td>I (α)</td>
<td>16-18°C</td>
</tr>
<tr>
<td>II (α')</td>
<td>22-24°C</td>
</tr>
<tr>
<td>III (β)</td>
<td>24-26°C</td>
</tr>
<tr>
<td>IV (β')</td>
<td>26-28°C</td>
</tr>
<tr>
<td>V (β)</td>
<td>32-34°C</td>
</tr>
<tr>
<td>VI (β)</td>
<td>34-36°C</td>
</tr>
</tbody>
</table>

Fat bloom: main defect in chocolate confections, identified by a beige coating, due to the uncontrolled crystallization of cocoa butter

New methods to temper chocolate
- Ultrasounds
- Pressure

Measurement of tempering
- X-ray diffraction
- Differential scanning calorimetry
- Temper meter: more simple and cheap, used in industry → measures the temperature profile of chocolate crystallization

Chocolate storage
Chocolate must be stored at room temperature, without fluctuations and, when possible, with controlled relative humidity.