Starch

FDSC400

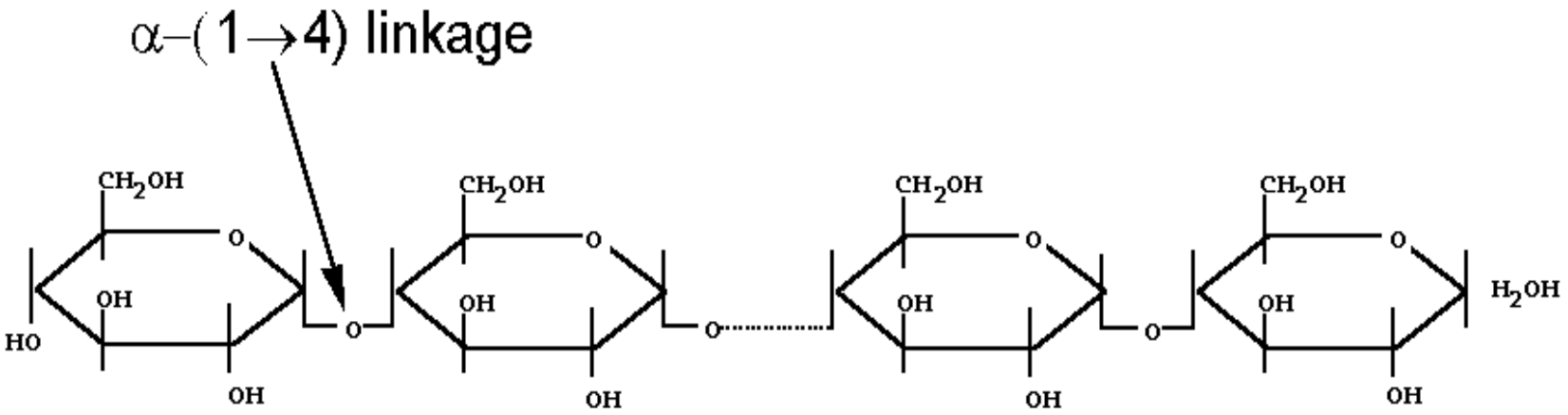
Goals

- Starch structure
- Starch gelatinization
- Modified starches
- Cellulose structure
- Cellulose ingredients

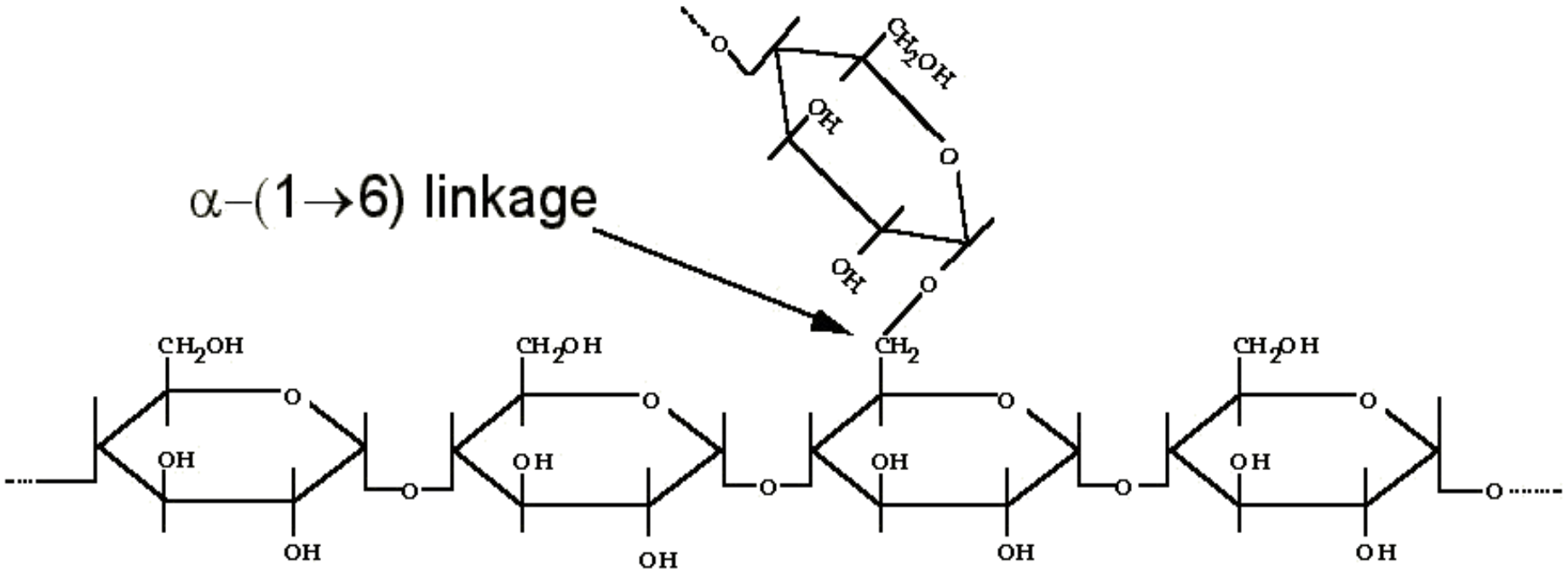
Starch Composition

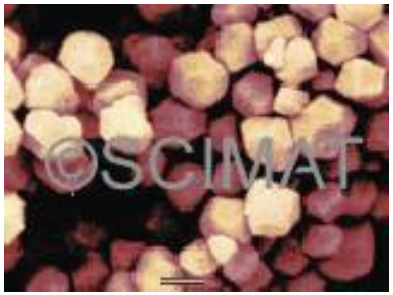
- **Amylose**. Linear α-1,4 glucose chain. DP: 180-320, MW~10^6. Branch approximately every 200 glucose units
- **Amylopectin**. Linear α-1,4 chain with an α-1,6 branch approximately every 20 glucose units. MW~10^8
- Amylose: amylopectin ~ 1:3
  - Waxy starches all amylopectin
  - High amylose mutants up to 70% amylose

Amylose Structure



Amylopectin Structure





Amaranth starch

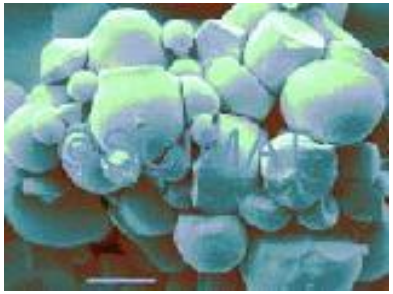
(Bar: 1 µm)

Arrowroot starch

(Bar: 20 µm)

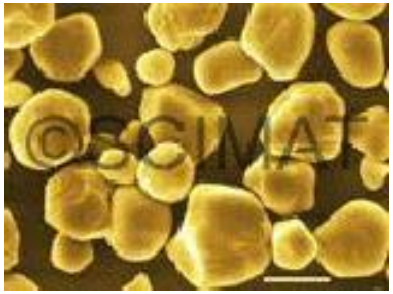
Buckwheat starch

(Bar: 5 µm)



Cassava starch

(Bar: 10 µm)

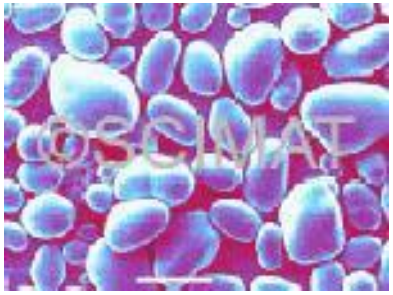


Corn starch

(Bar: 10 µm)

Oat starch

(Bar: 5 µm)



Potato starch

(Bar: 50 µm)

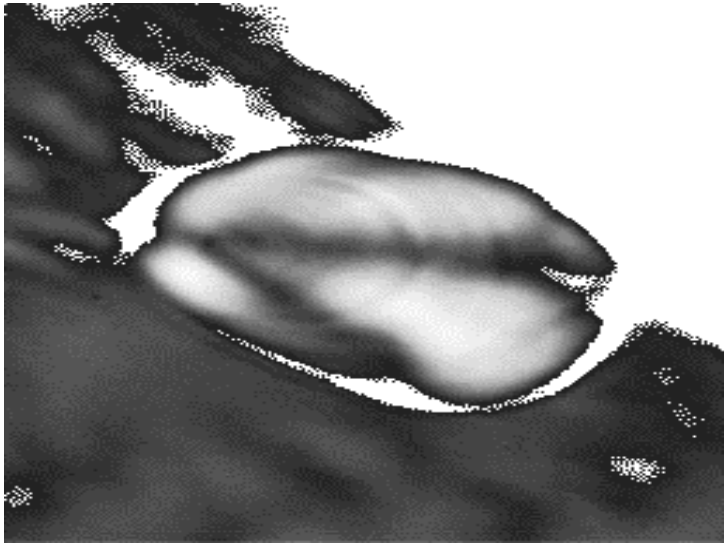
Rice starch

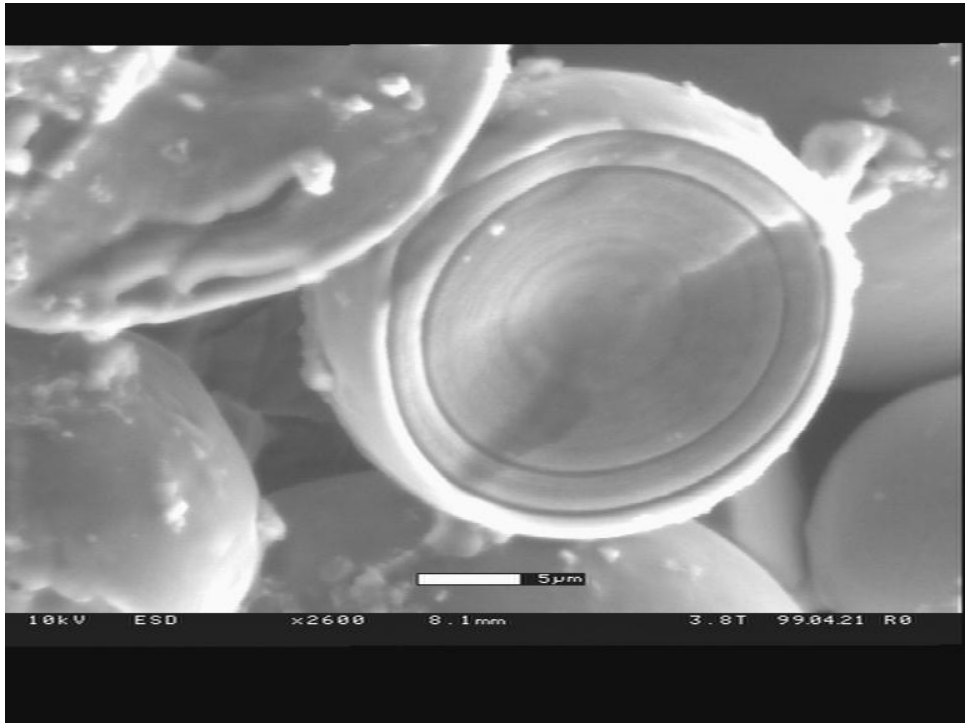
(Bar: 2 µm)

Kidney bean starch

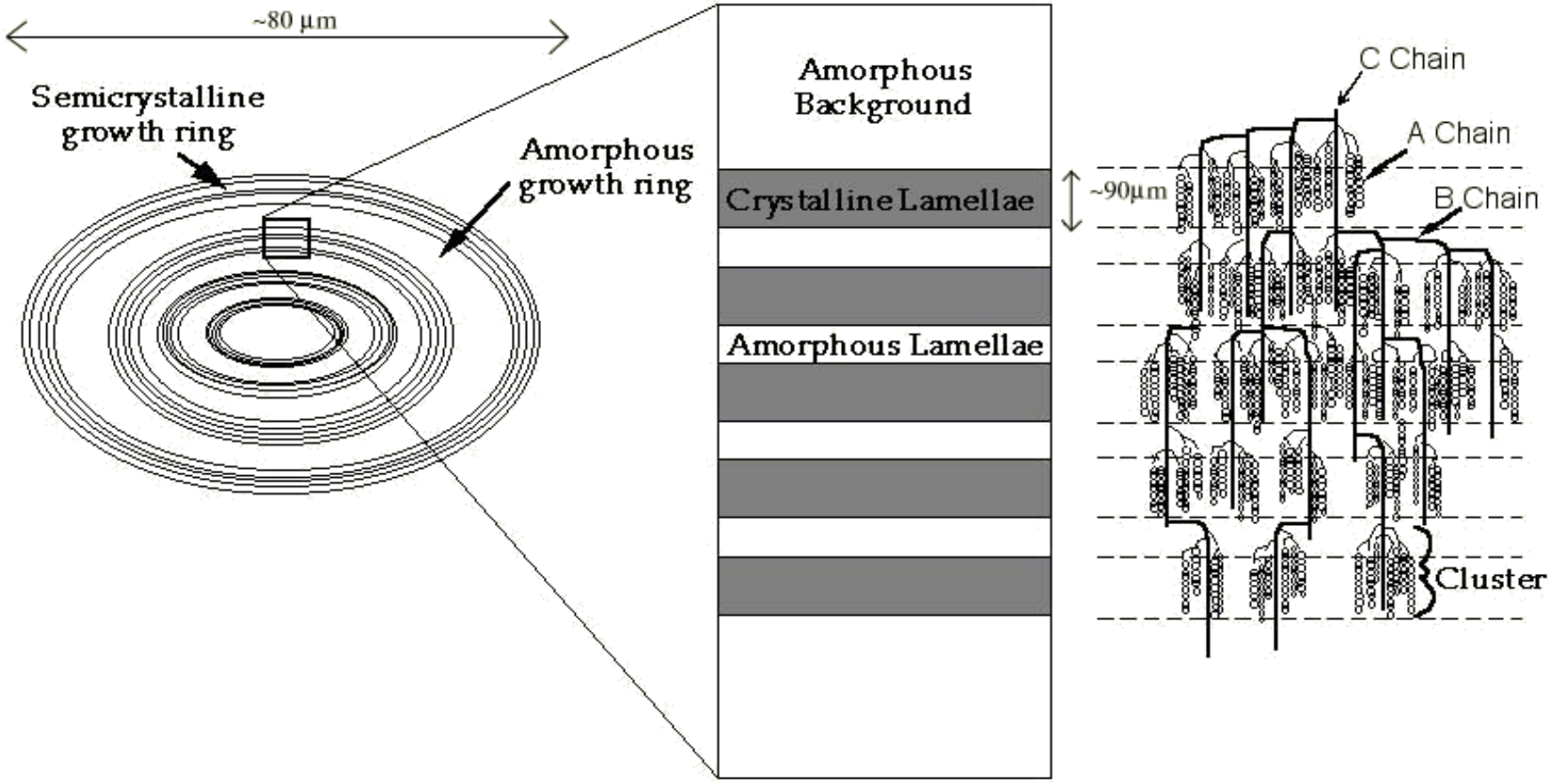
(Bar: 20 µm)

Granule Structure



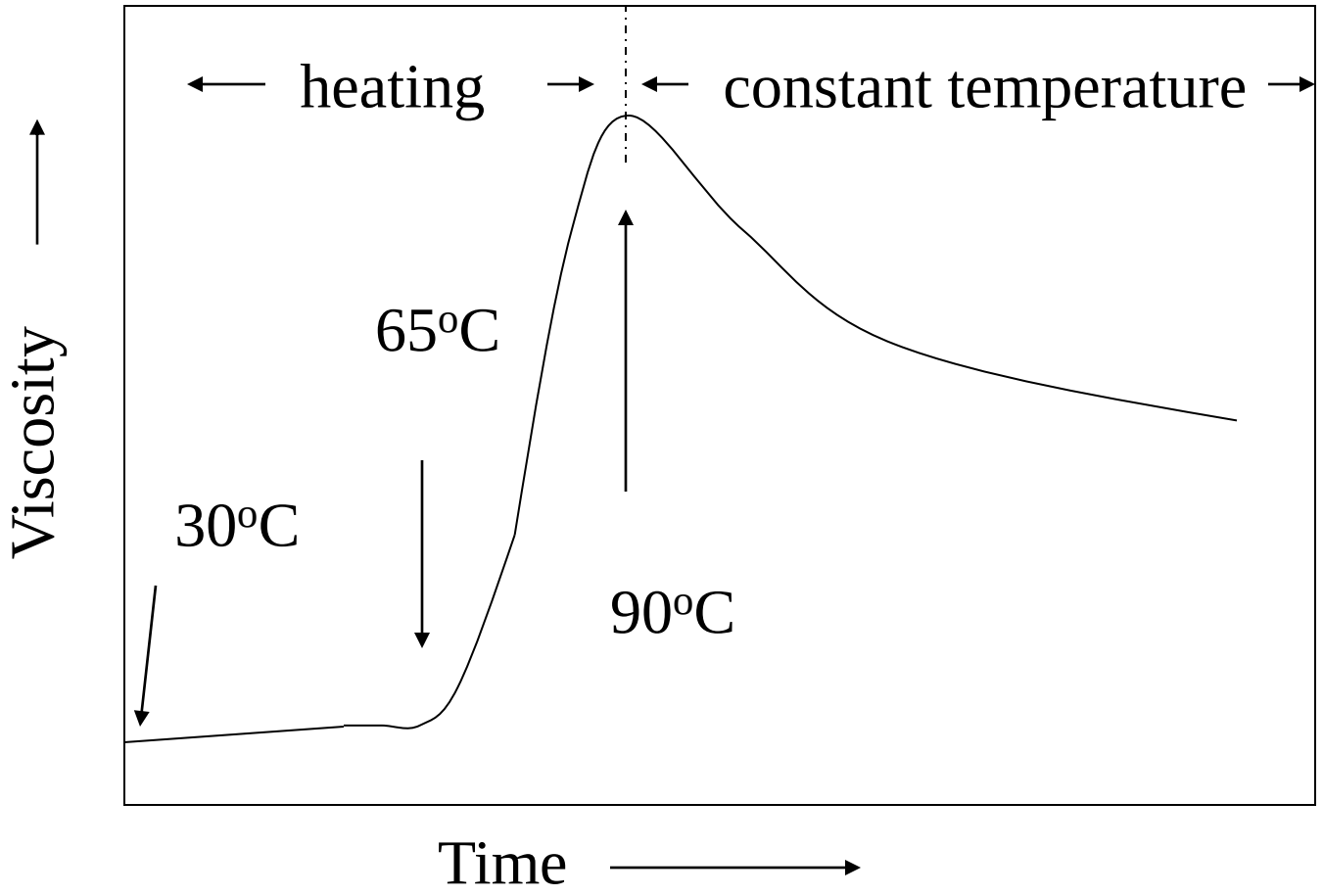


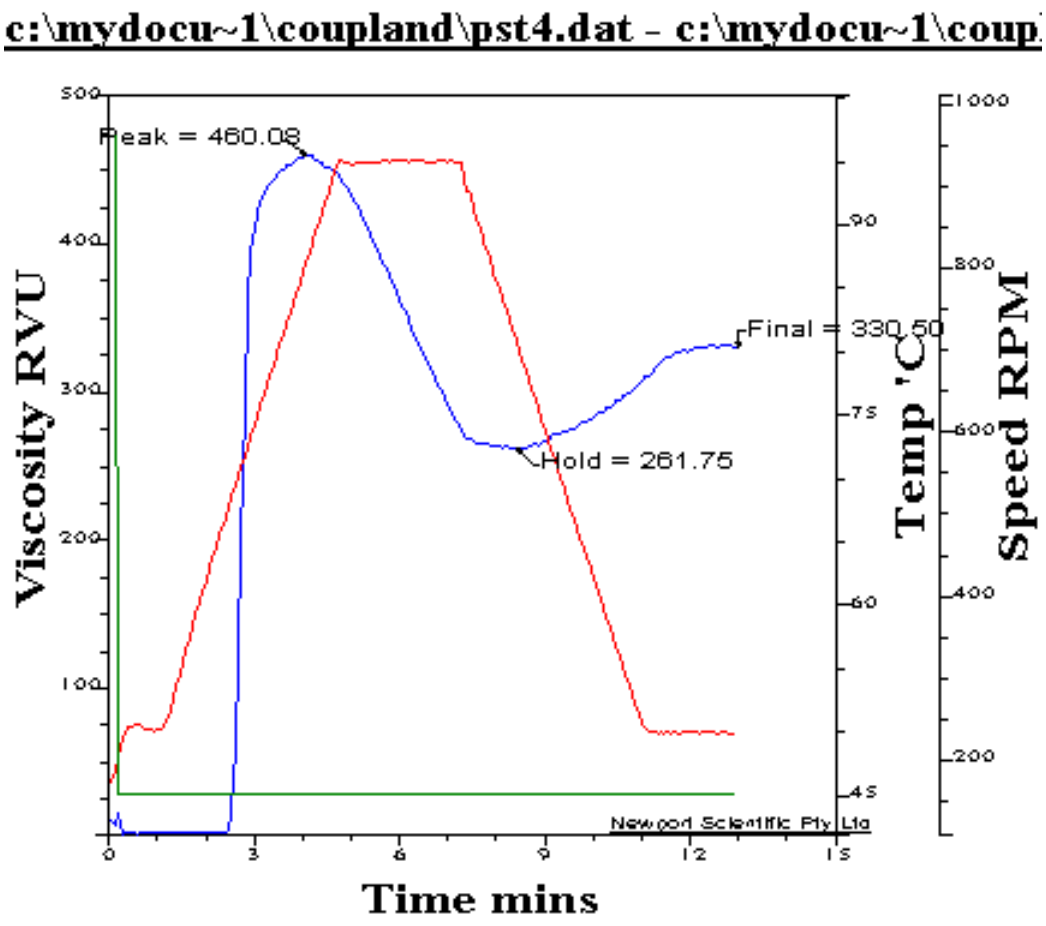
Amylopectin in Granules



Visco/Amylo/Graph

ViscoAmyloGraph




c:\mydocu~1\coupland\pst4.dat - c:\mydocu~1\coup
Peak = 460.08
Final = 330.50
Hold = 261.75
Viscosity RVU
Temp 'C
Speed RPM
Time mins
Newport Scientific Pty Ltd
500
400
300
200
100
90
75
60
45
1000
800
600
400
200
0
3
6
9
12
15

Starch Ingredients

- Must be cooked
- Gel slowly
- Show syneresis
- Break down under shear
- Break down under acid conditions
- Forms complexes

Modified Starches

- Depolymerized
  - Acid etched
  - Acid hydrolyzed
  - Enzyme modified
- Pregelatinized
- Chemically modified
  - Stabilized
  - Cross linked

Cellulose Structure

- β-1,4 polyglucose
- Very large molecule
- Crystalline (hydrogen-bonded) and non-crystalline regions

Cellulose Ingredients

- Microcrystalline Cellulose
- Carboxymethyl cellulose
- Methyl cellulose and hydroxypropyl methyl cellulose