

Introdução. O estado coloidal.
Sistemas coloidais.





Como se forma?

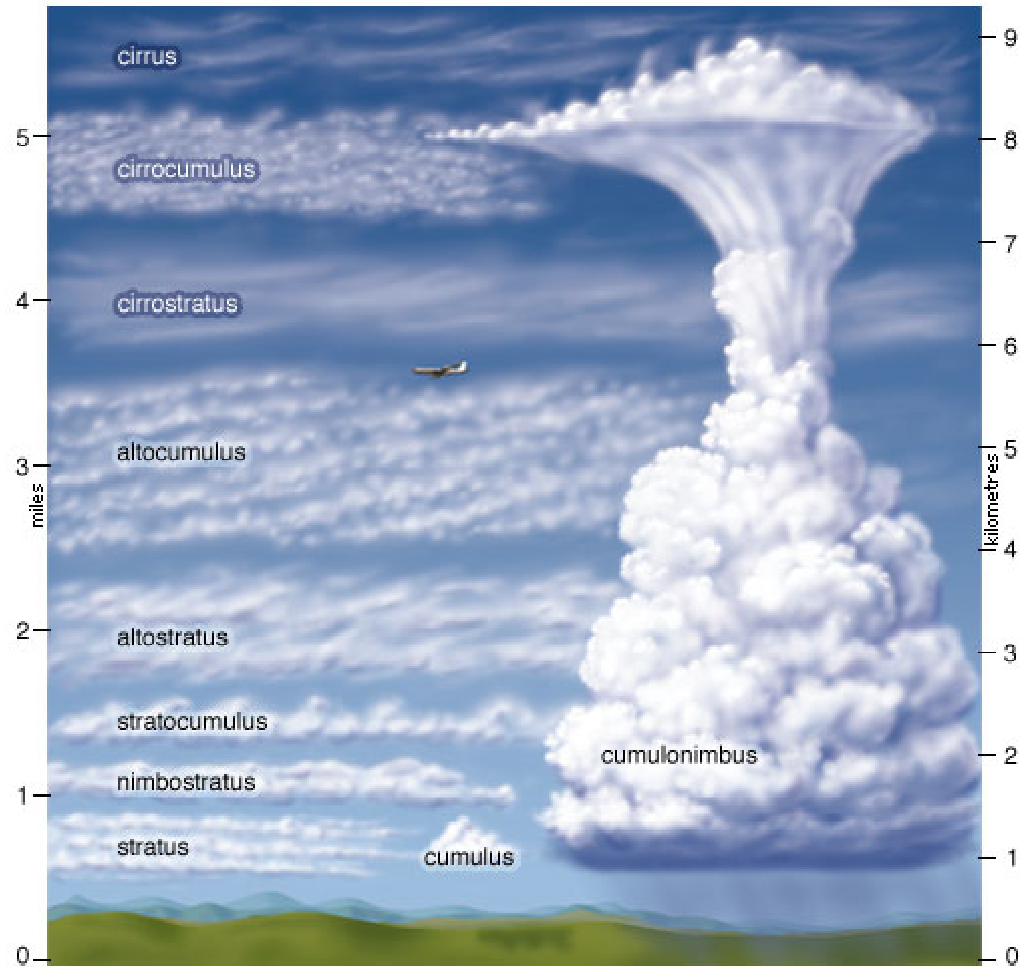
Cor?

O que é?

Quanto dura?

Variações de um mesmo sistema

- Sempre: água na atmosfera
- Muitas formas, em diferentes escalas
- Propriedades diferentes
 - Óticas
 - Elétricas
- Mudam com o meio



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Diverse-Clouds



Cirrus



Alto Cumulus Mackerel



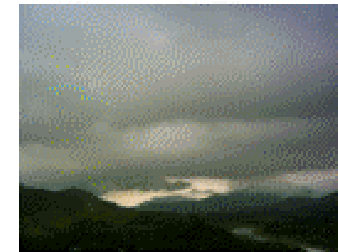
Alto Cumulus



Alto Cumulus
Standing Lenticularis



Cumulus



Nimbo Stratus



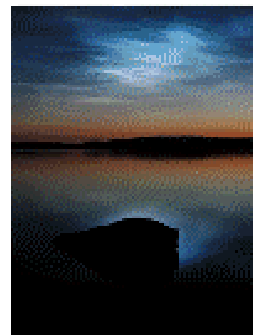
Cumulonimbus



Mammatus



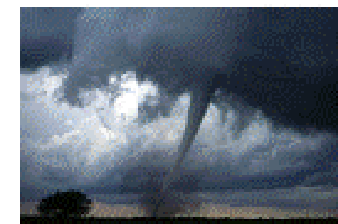
Shelf Cloud



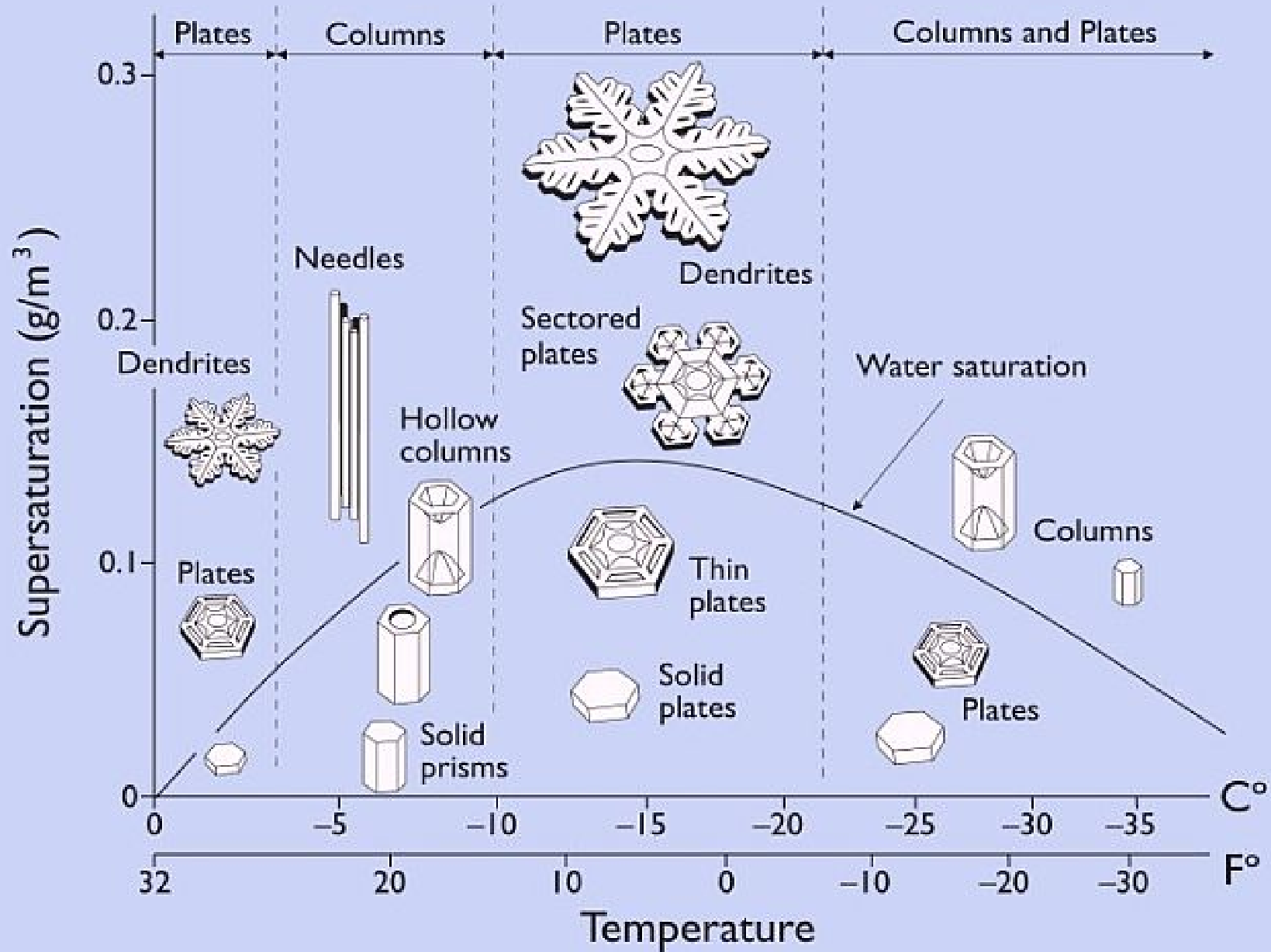
Noctilucent



Contrail



Tornado



<http://pandasthumb.org/archives/2007/01/mystery-in-the.html>



National Weather Service • Since 1870

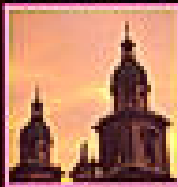


Group One Cumulus (puffy) Family



Cumulus Puffy, billowy, flat-topped clouds with rounded tops. They are the most common type of cloud and are often seen in the afternoon.

Group Two Stratus (Layer) Family



Stratus Low, flat, gray clouds that cover the sky like a blanket. They often bring light drizzle or rain.

Group Three Rain & Snow, Rain & Snow



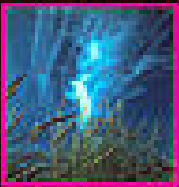
Nimbostratus Low, dark, gray clouds that bring steady rain or snow. They are often seen in the morning or evening.

Group Four Freezing Rain, Freezing Rain



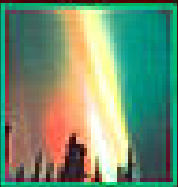
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Group Five Freezing Rain, Freezing Rain



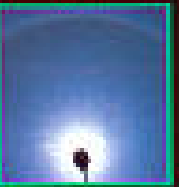
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Group Six Optical, Optical



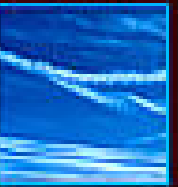
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Group Seven Optical, Optical



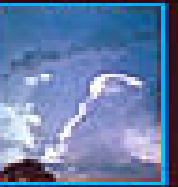
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Group Eight Optical, Optical



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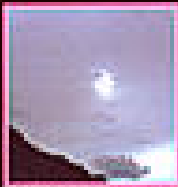
Group Nine Optical, Optical



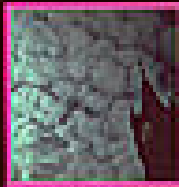
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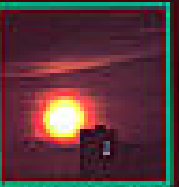
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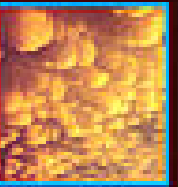
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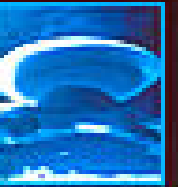
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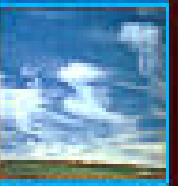
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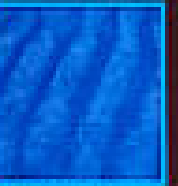
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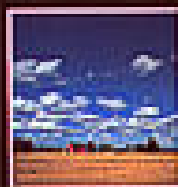
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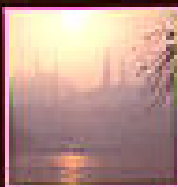
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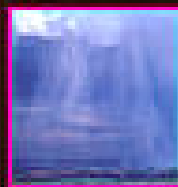
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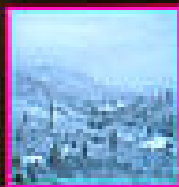
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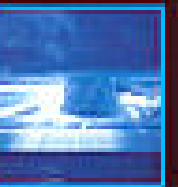
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National Weather Service Skywatcher Chart

www.srh.weather.gov



National Weather Service
Southern Region

The National Weather Service is a part of the National Oceanic and Atmospheric Administration (NOAA), which is an agency of the United States Department of Commerce. The NWS is responsible for providing weather forecasts, warnings, and other information to the public. The Southern Region of the NWS covers the states of Alabama, Georgia, Florida, and South Carolina. The NWS Southern Region is located at 133 Peachtree Avenue, NE, Atlanta, GA 30309. The NWS Southern Region can be reached at (404) 527-3000. The NWS Southern Region website is www.srh.weather.gov.

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Consequências graves



Até em Campinas (em 1899)!



http://4.bp.blogspot.com/_BI7q_K6Trj4/Rb1__CBMssl/AAAAAAAAABo/vjbadqOo7oo/s400/Rua+Barao+Jaguara++inundada+em+1899.JPG

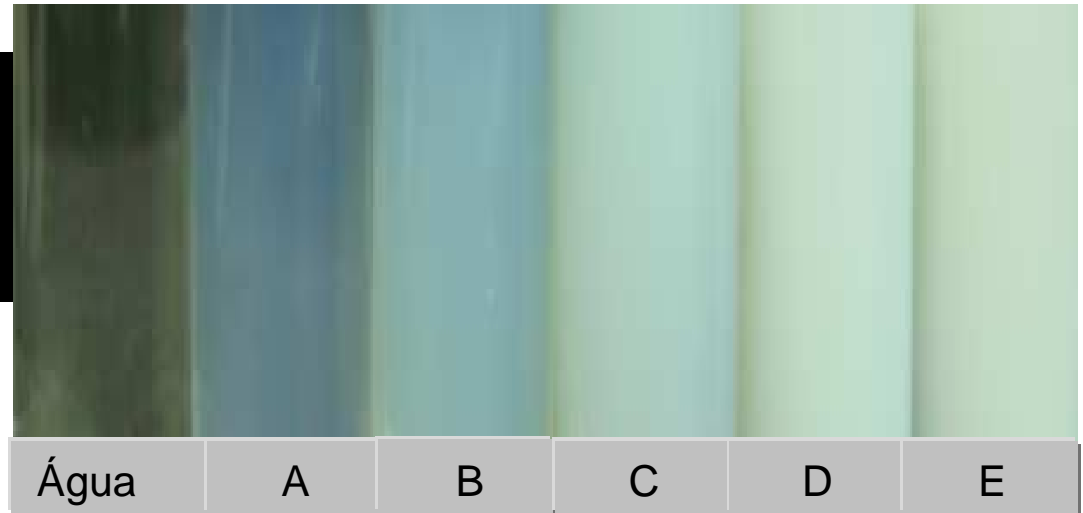
Fumaça:
sólido em
gás



Líquidos e Géis Coloidais

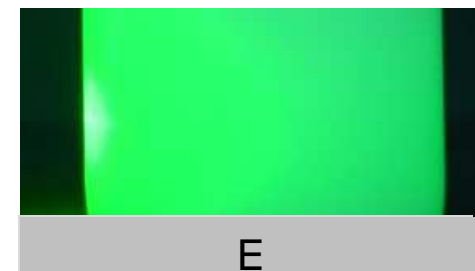
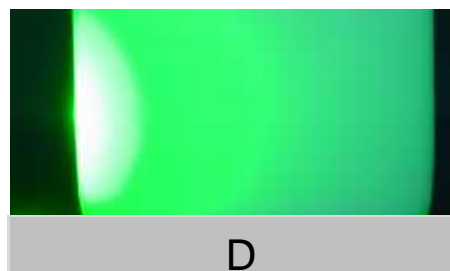
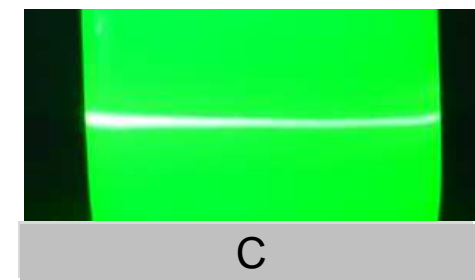
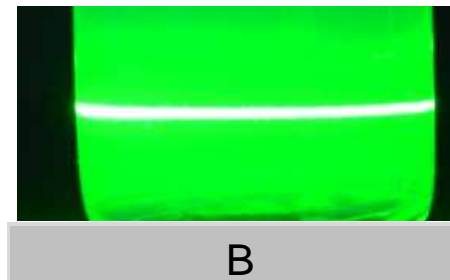
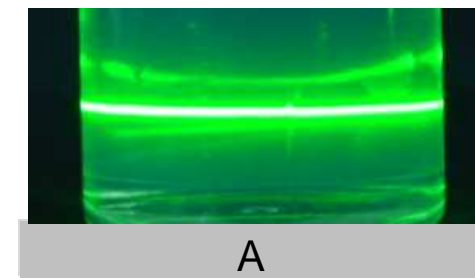
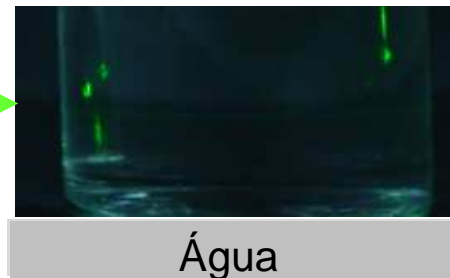
- Dispersões de sólidos em líquidos: sóis
- Dispersões de líquidos em líquidos: emulsões
- Dispersões que apresentam viscoelasticidade: géis
 - Também há géis monofásicos: gelatina em água

- Iluminação com luz branca, indireta

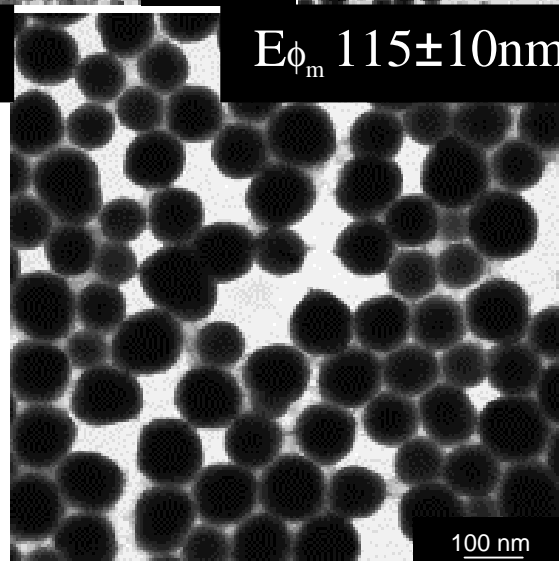
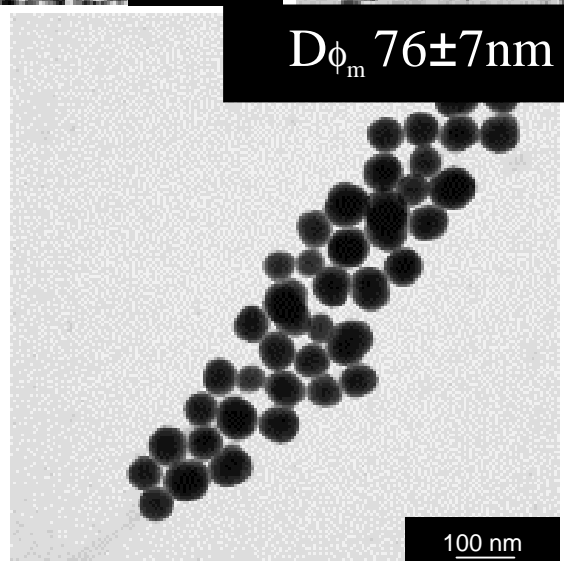
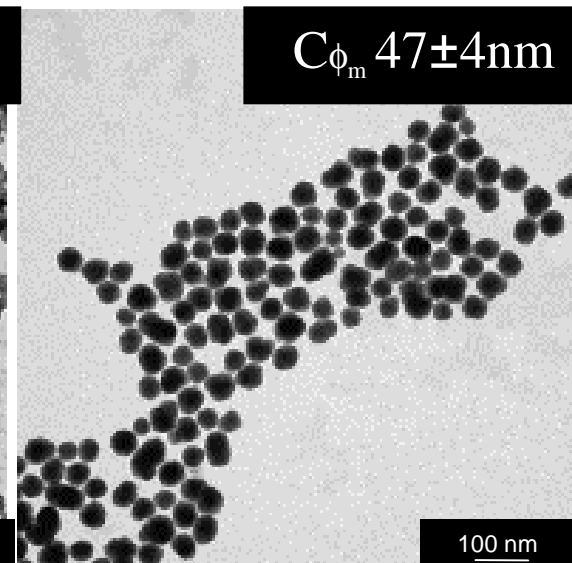
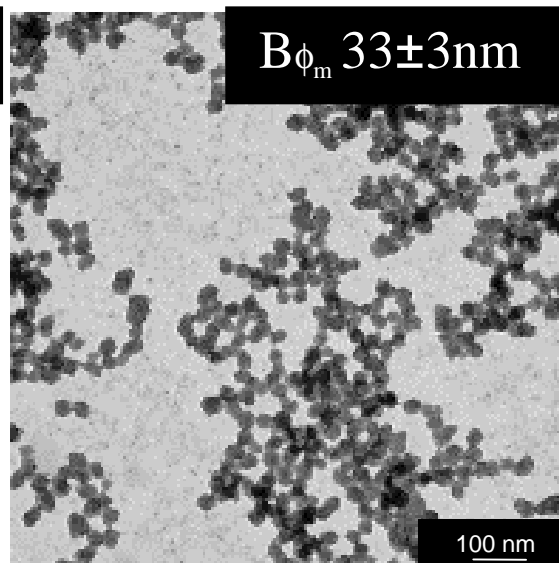
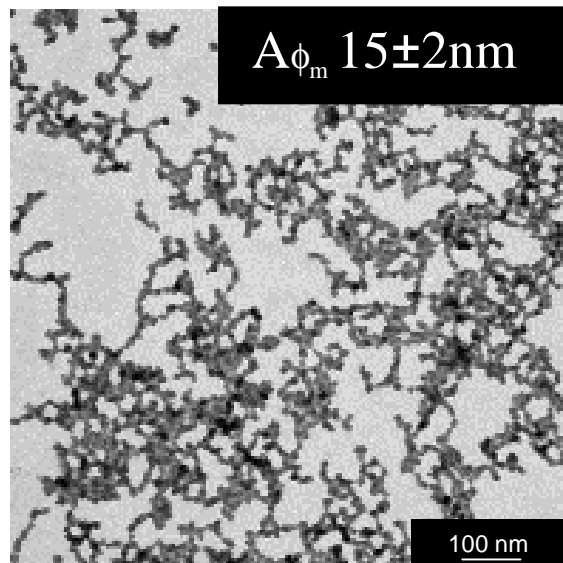


laser →

- Iluminação com um feixe de laser (5 mW e 532nm)



TEM



Partículas de látex

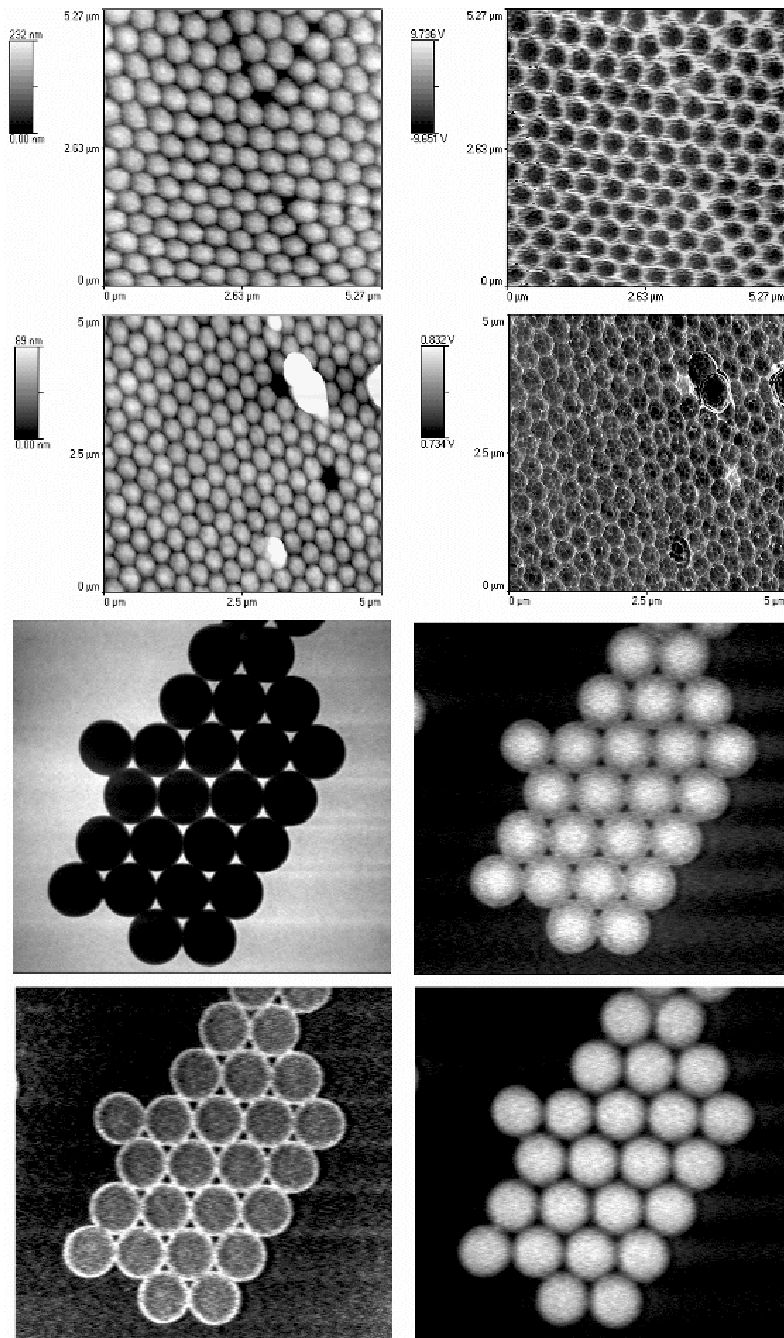
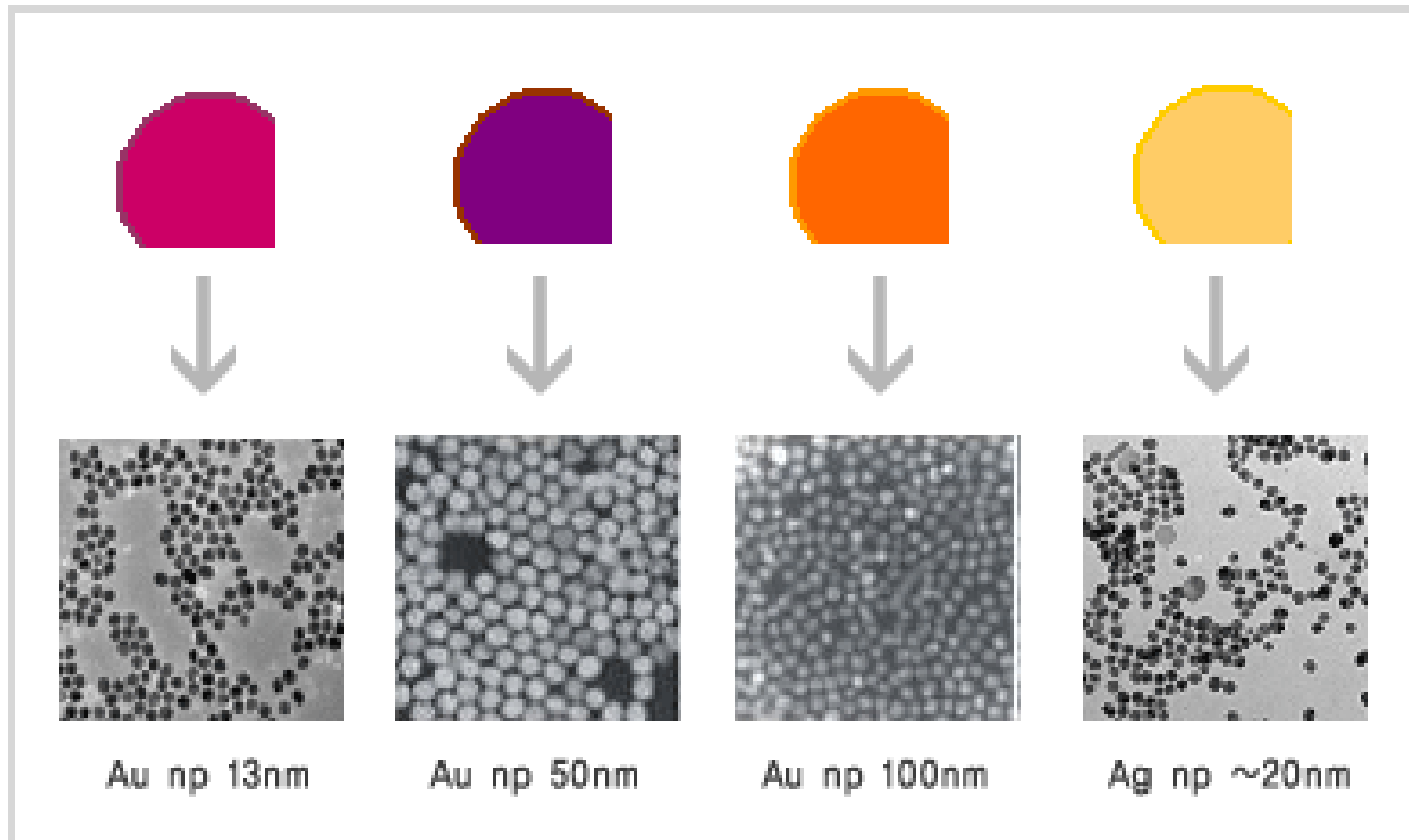


Fig. 4 – Micrographs of PS-HEMA latex particles, from top to bottom: 1) AFM (left) and SEPM (right) images of the same field; 2) AFM (left) and EFM (right) images of another field; 3) bright-field electron micrograph (left) and C distribution map (right); 4) K (left) and S (right) elemental maps. The last four images are from the same field.

<http://www.scielo.br/img/fbpe/abc/v73n4/q4f4.gif>

Nanopartículas metálicas



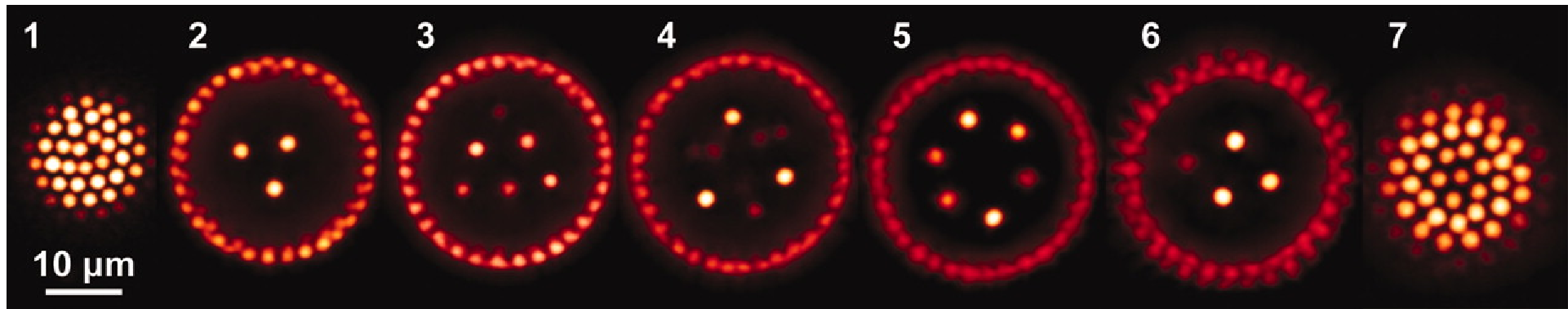
http://bcbd.kaist.ac.kr/image/page/nanoparticle_img1.gif



Formação de cristais e
cristais-líquidos coloidais

[www.chm.bris.ac.uk/
pt/jeroen/jsvdhome.html](http://www.chm.bris.ac.uk/pt/jeroen/jsvdhome.html)

Imagens em microscópio confocal: seccionamento de cristais coloidais



Alfons van Blaaderen et al.

<http://www.pnas.org/content/104/8/2585/F4.large.jpg>

Espumas

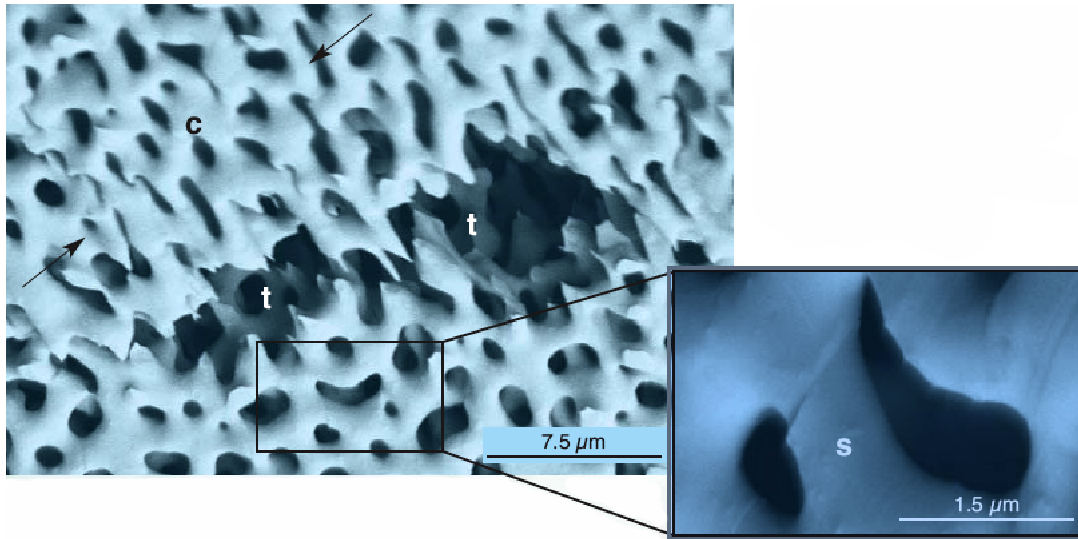


www.microscopy-uk.org.uk/mag/artapr01/foam.html

A microscopic view of plant tissue, likely an onion skin, showing a network of large, roughly rectangular cells with thick, dark cell walls. The cells are arranged in a brick-like pattern. The interior of the cells is lighter and contains some internal structures. A copyright notice is overlaid in the center.

© Microscope World

Espuma sólida: metal



https://www-pls.llnl.gov/data/assets/images/science_and_technology/materials/metal_foam/fig2.jpg

Espuma sólida: polímero+CaCO₃

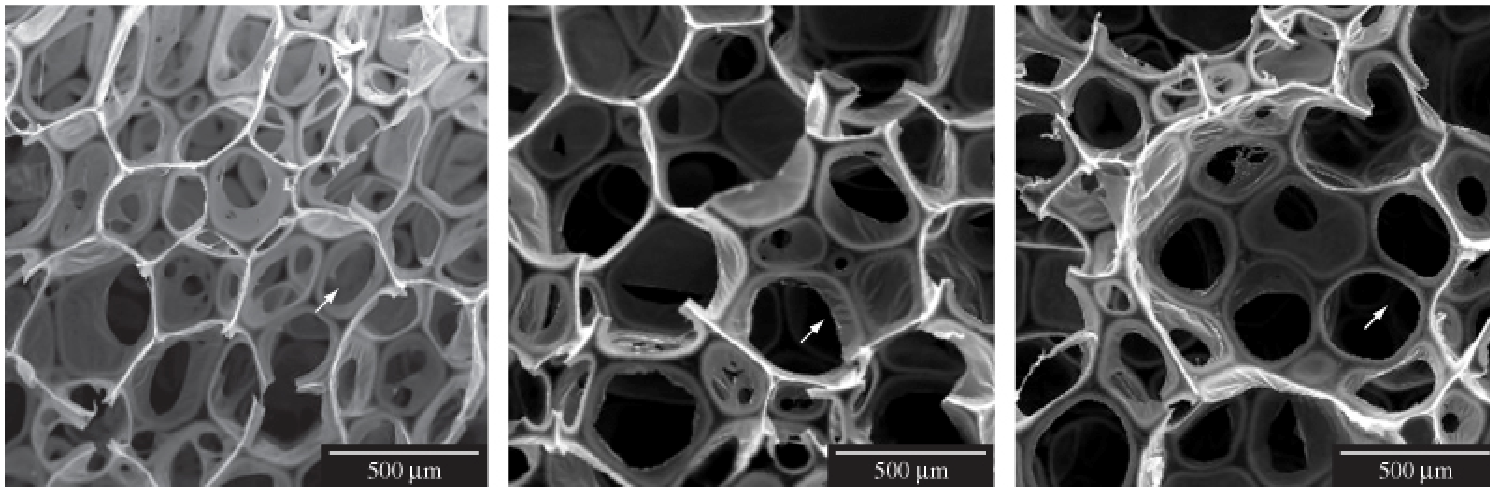
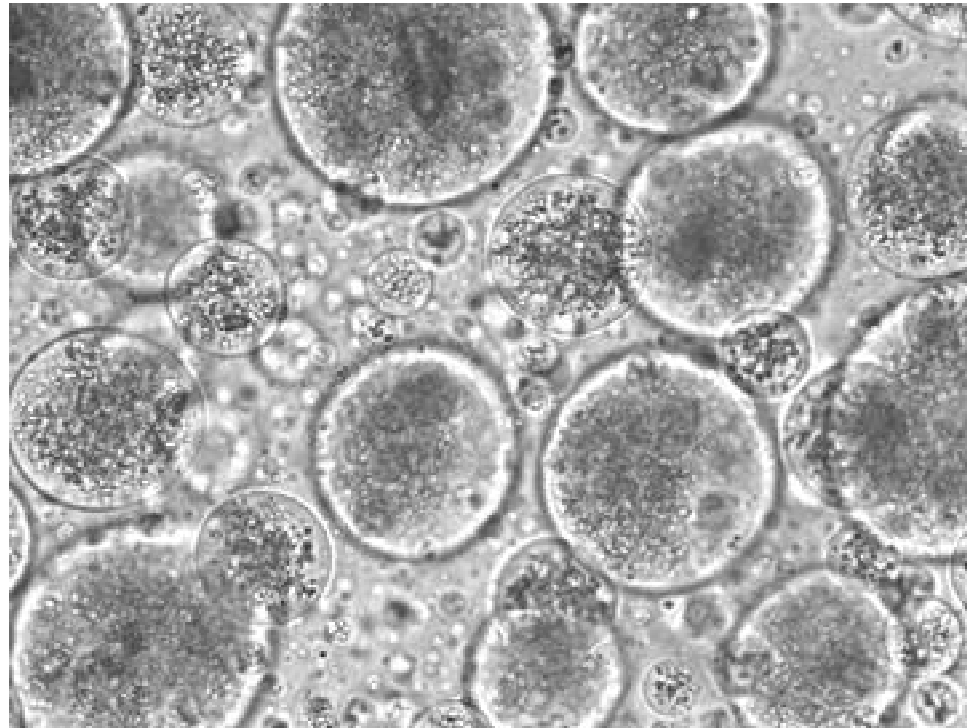


Figure 4. SEM of flexible polyurethane foam filled with carbonate at concentrations of 9, 15 and 21% (magnification of 50×).

<http://www.scielo.br/img/revistas/mr/v11n4/09f4.jpg>

Emulsão



http://people.umass.edu/mcclemen/Group_files/image005.jpg
image005.jpg

Sistemas de interesse

- **Aerossóis e fumaças**
- **Soluções e misturas de polímeros**
- **Dispersões de partículas sólidas ou líquidas**
- **Espumas sólidas ou líquidas**
- **Monocamadas**
 - Em líquidos
 - Em sólidos
- **Sistemas micelares**
- **Agregados moleculares ou iônicos**

O estado coloidal: uma questão de *tamanho*

- ***Normalmente:***

Líquidos têm a forma do seu recipiente

Líquidos escorrem por um tubo, para baixo

Vasos comunicantes têm o mesmo nível

A pressão de vapor de um líquido é função de T

- ***Em dimensão coloidal:***

As formas são: esférica, de lente ou de filme

Líquidos sobem ou descem por um tubo

Vasos comunicantes não têm o mesmo nível

A pressão de vapor também é função do raio da gota ou menisco

Questões

- Escolha um material coloidal.
 - Quais são os seus componentes?
 - Por que são vários componentes?
 - O sistema é estável ou instável?
 - Qual é a escala de tempo de duração do sistema?
 - Descreva e discuta uma transformação sofrida pelo sistema.