

Chemical Analysis based on Drying Pattern



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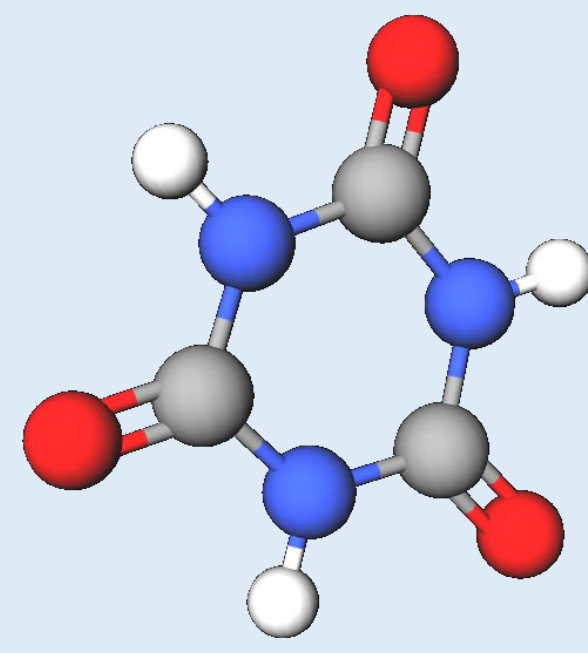


The idea

- Inspiration: drying patterns of body fluids can be used for diagnostic purposes. Can they also be used for chemical analysis?
- A ring is the typical drying pattern of a drop on a surface, formed because the evaporation rate is higher at the edge of the drop than at its center.
- Other patterns are also possible!

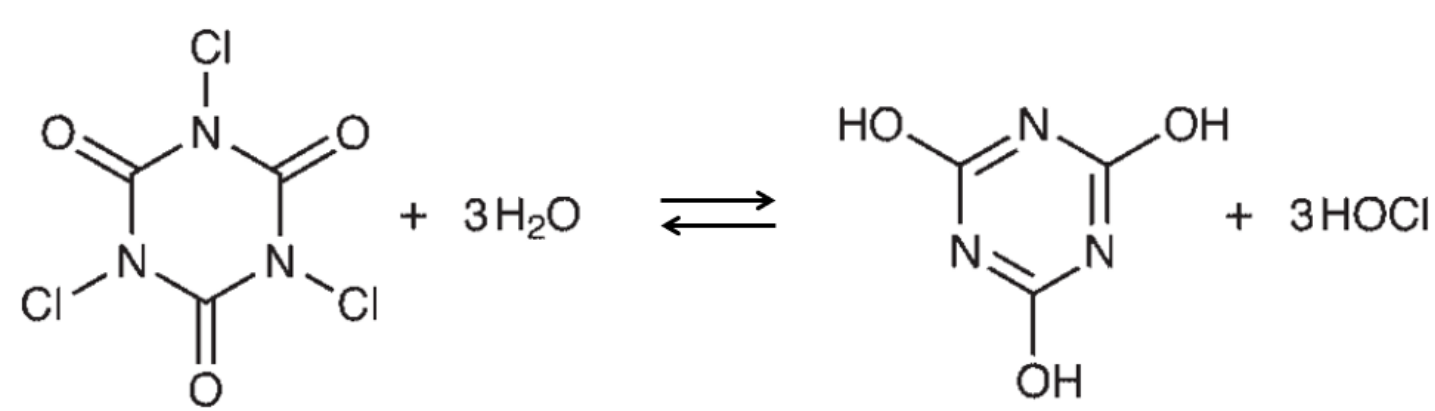
Cyanuric acid (CYA)

- Used in swimming pools as a stabilizing agent for chlorine
- Chlorine is used for sanitation in swimming pools, but it decomposes in sunlight
- Commercial reagents for swimming pools already include cyanuric acid
- The existing "on site" analytical methods have large errors



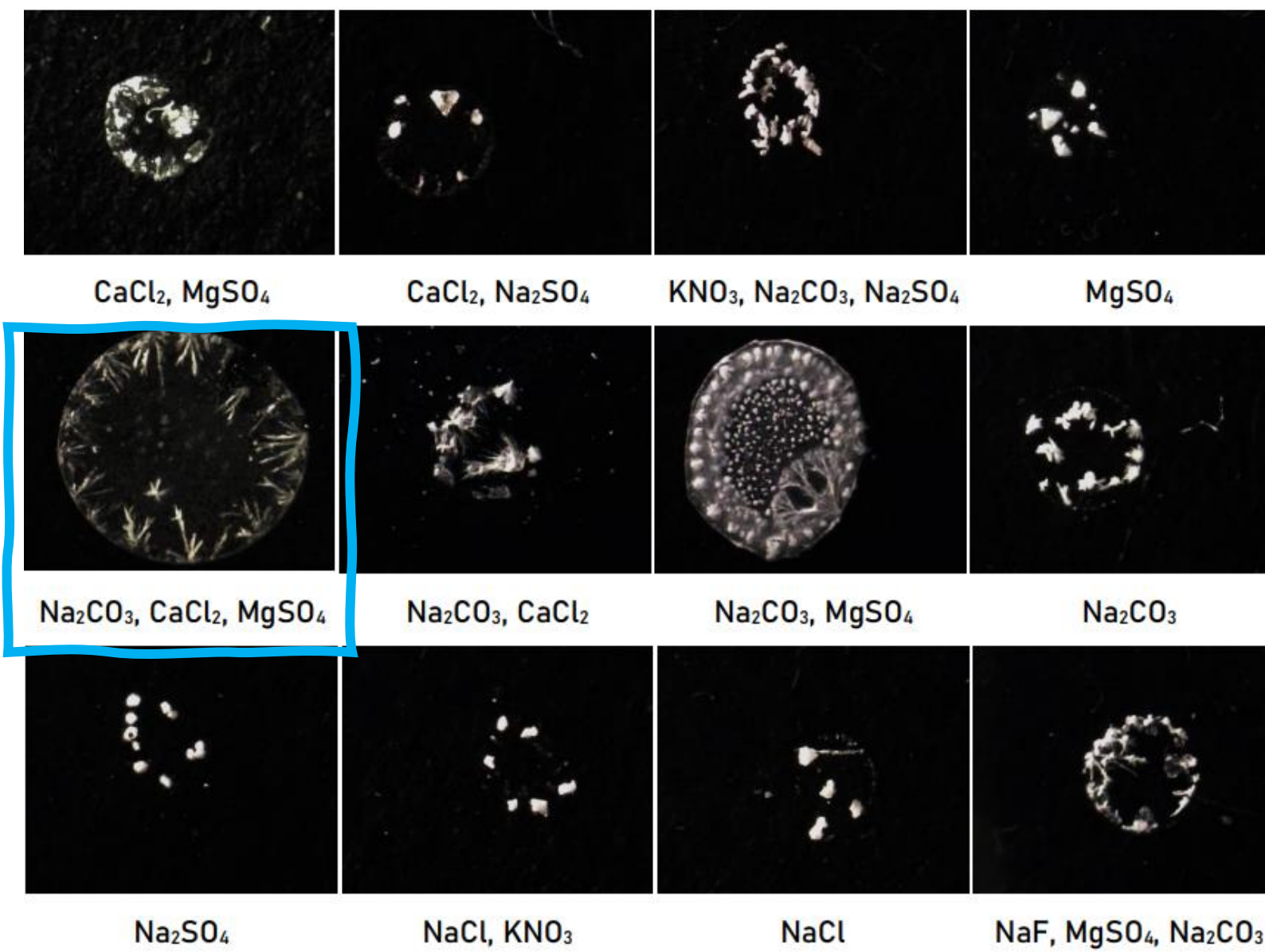
Solubility:
2.7 g/L

Recommended
concentration:
20-80 mg/L

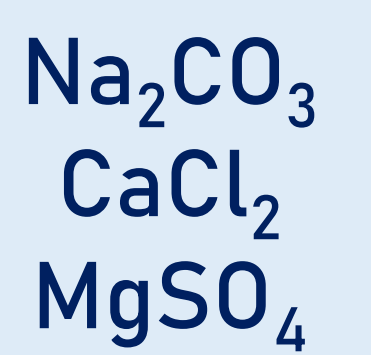


Explanation

The dendrites do not appear in distilled water solution of CYA

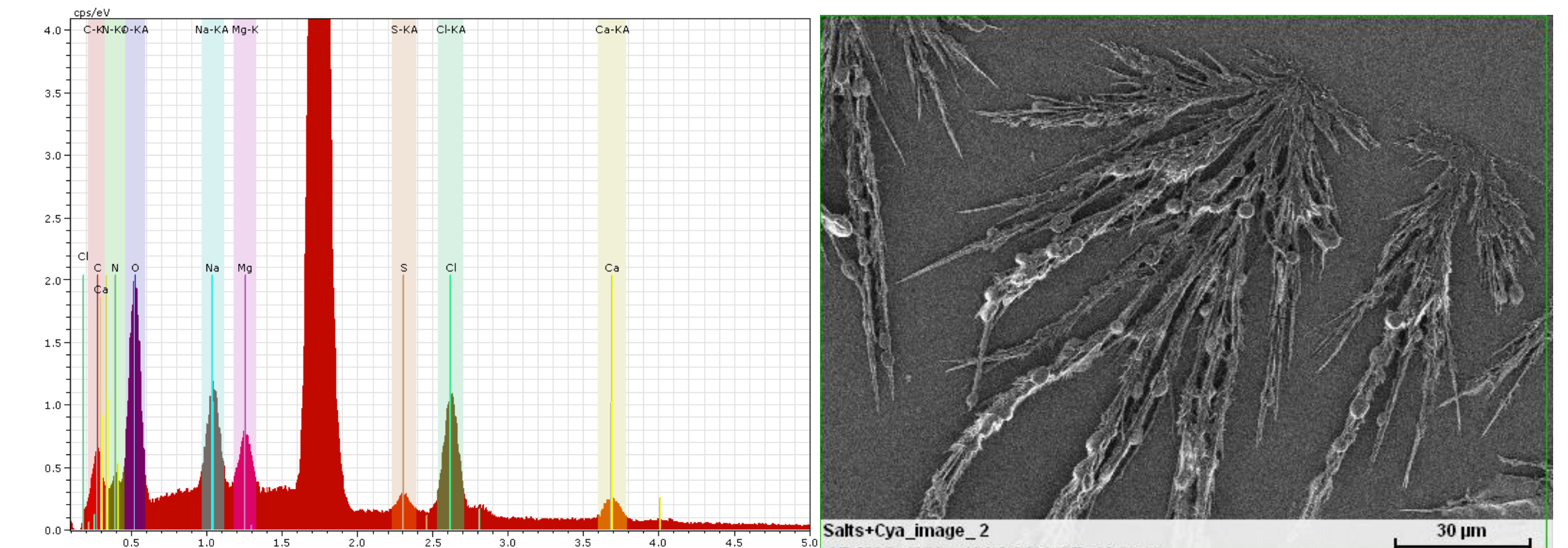
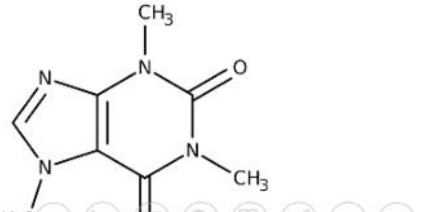
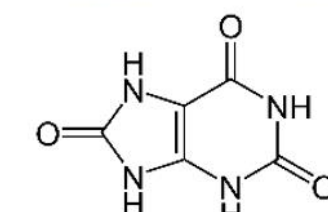
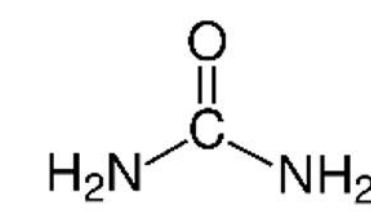
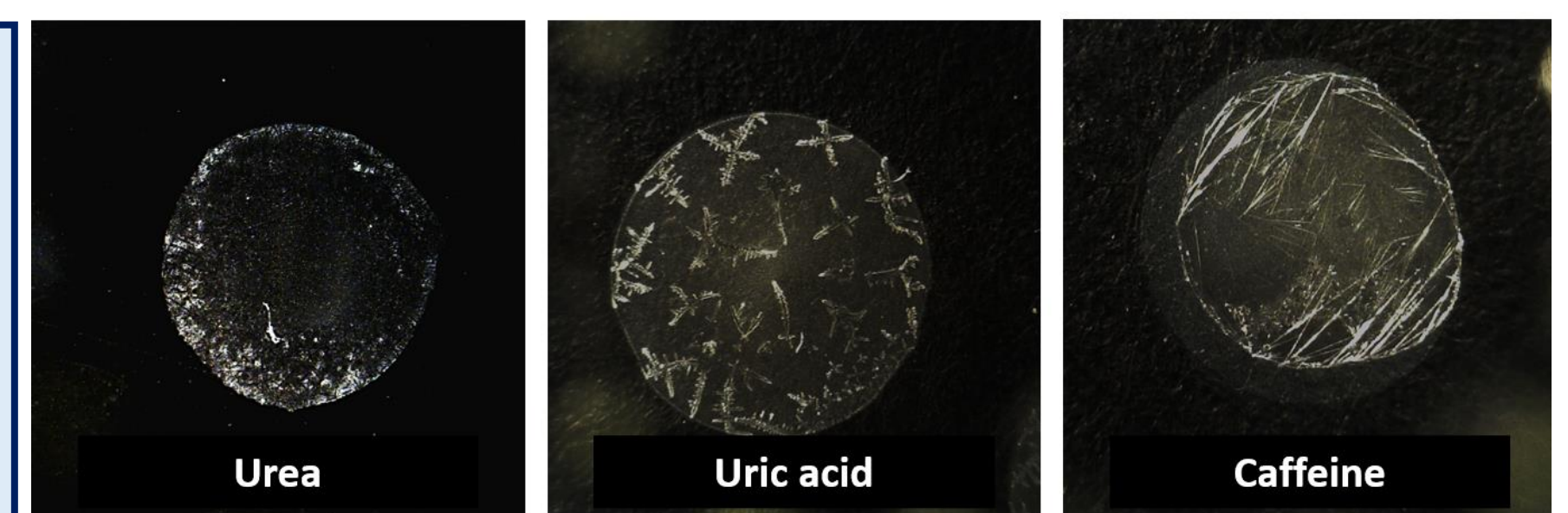


3 salts are essential for the dendritic growth:



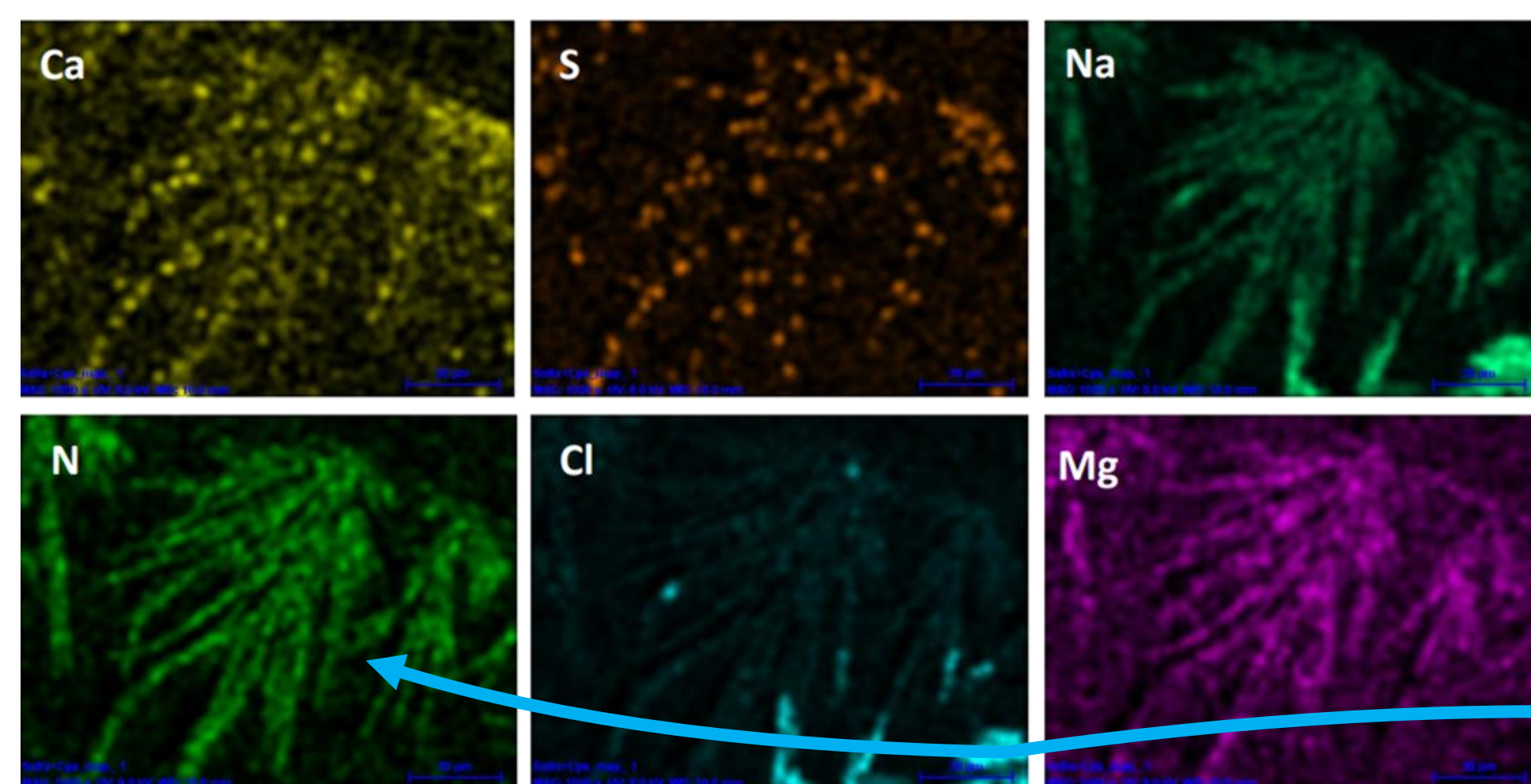
All of them present in tap water and in swimming pools

The pattern is unique for CYA



EDS spectrum: chemical composition

Secondary electrons: topography



EDS mapping of the elements in the surface

The dendrites are made of CYA!

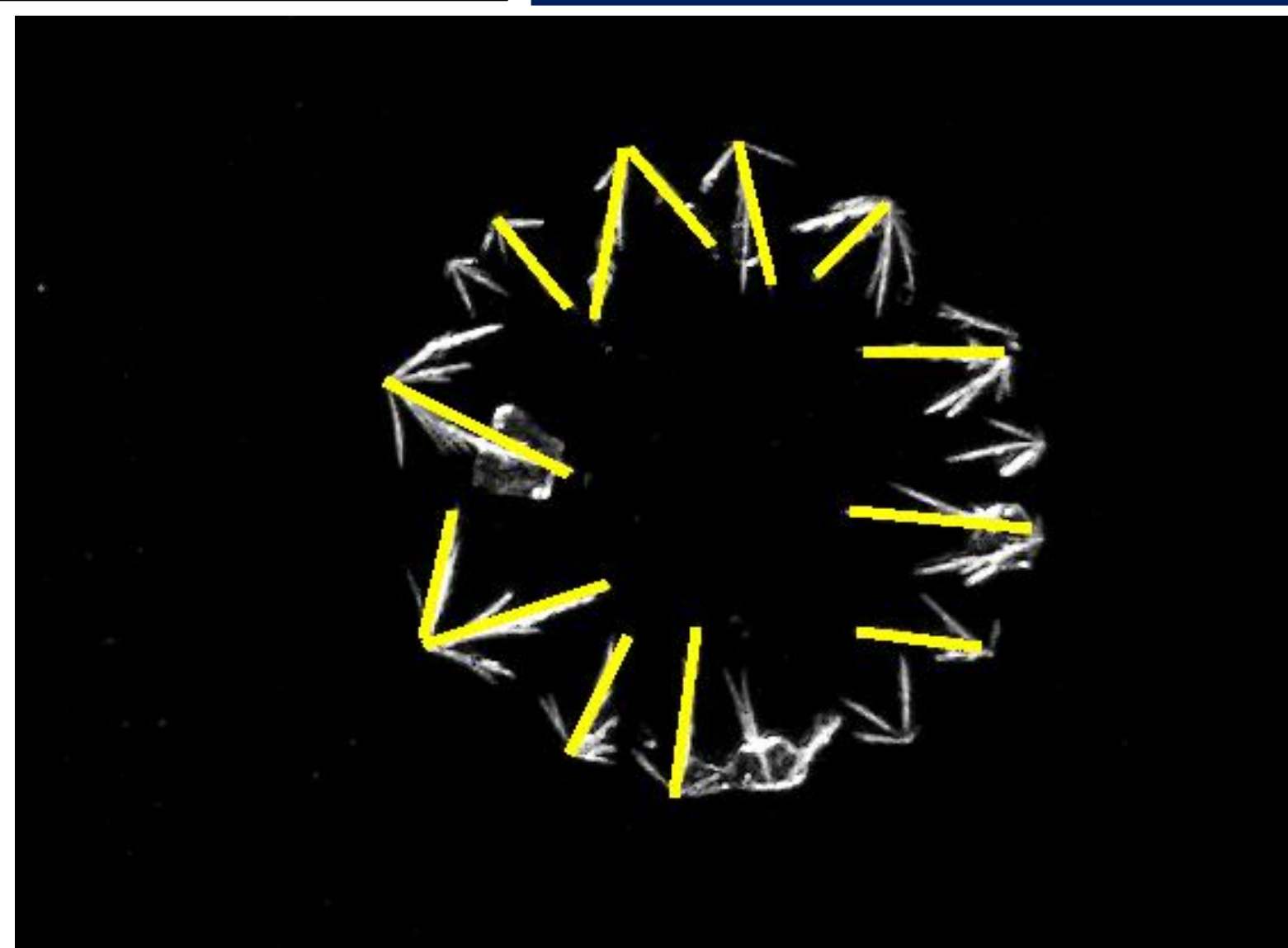
The proposed method

Drying 50 μL drops of the solution in tap water on a polystyrene petri-dish

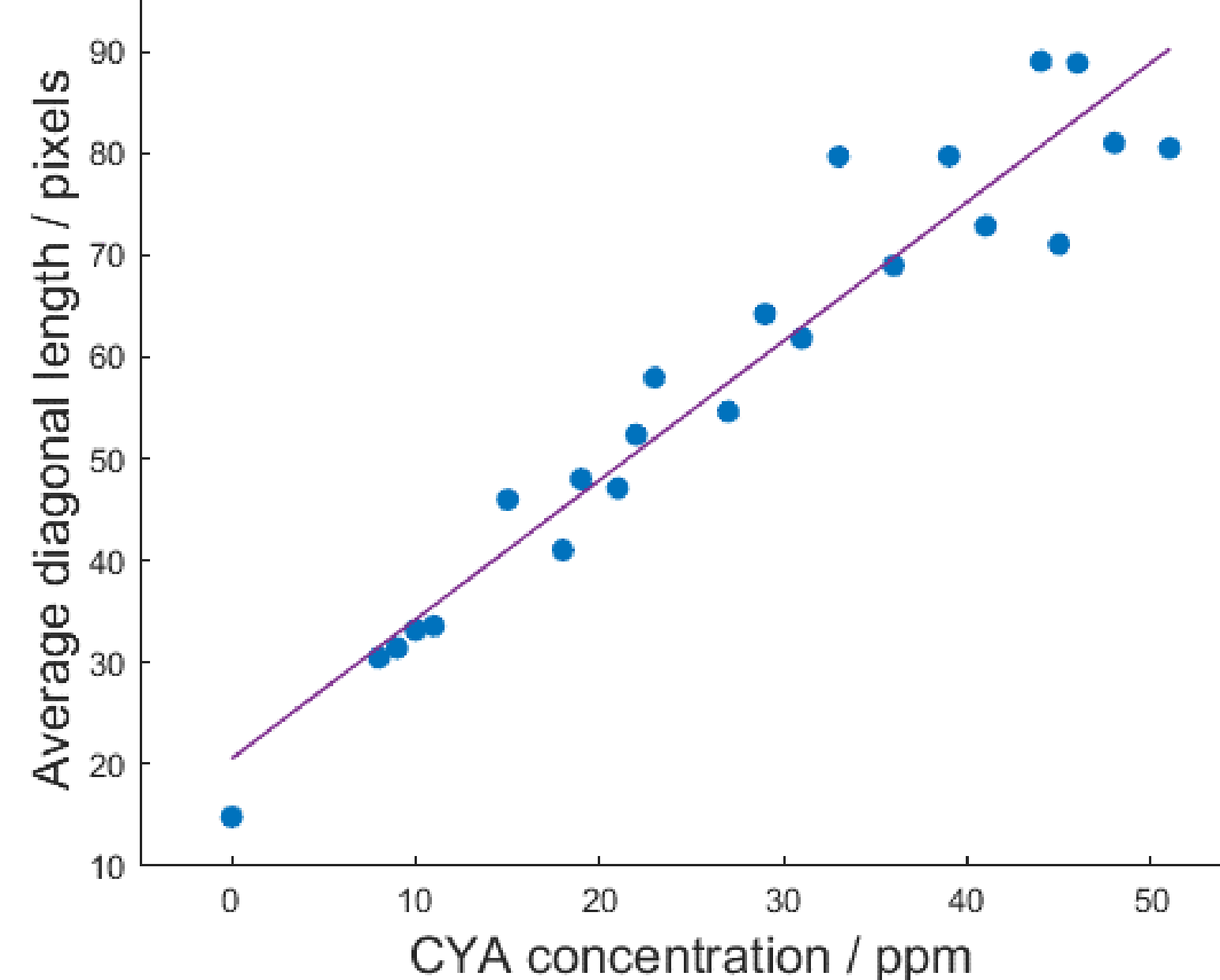


Photographing the resulted spots, using dark-field mode

Measuring the length of the formed dendrites



Results of an image processing algorithm



The Matlab function evaluates the dendrites length by the length of the diagonal of the bounding rectangle

