Specialized biocide nanocomposites

SILVER NANOPARTICLES AS BIOCIDE

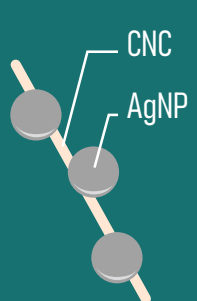
Silver nanoparticles (AgNPs) are **commonly used** in products as **biocides** to **limit the spread of mircro-organisms** by releasing Ag^+.

To obtain a long term efficiency, AgNPs are usually **added in excess.** This causes an unwanted release of Ag^+ that can damage the environment.

WHAT ARE BIOCIDE NANOCOMPOSITES?

NANO

One of the particle dimension is **smaller than 100 nm.**



NANOCOMPOSITE

Here a nanocomposite is defined as the association of **metallic nanoparticles** (AgNPs) grafted on **bio-sourced cellulose nano crystals** (CNC).

NANOCOMPOSITES AS A SAFER ALTERNATIVE

Grafting AgNPs on a support can avoid an important release of Ag^+ and its damaging effects on the environment.

Cellulose nano crystals (CNC) allow a better stabilisation and dispersion of AgNPs. Furthermore they are an efficient support for AgNPs grafting, because they have interesting properties:

- ✓ **renewable** and **bio-compatible**
- ✓ easily **biodegradable**

thickness: 7nm
length: 100nm - 100µm

These cellulose/AgNPs nanocomposites have **several advantages**:

- ✓ **Minimising the amount** of AgNPs incorporated
- ✓ Allowing a **controlled release**

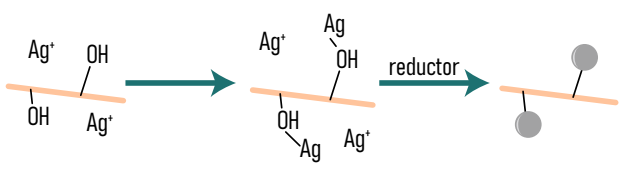
OBJECTIVE

Producing agents with low environmental impact and a **high biocide efficiency** using **cellulose/AgNPs nanocomposites.**

SOME RESULTS OF THE PROJECT

Synthesis of cellulose/AgNPs nanocomposites

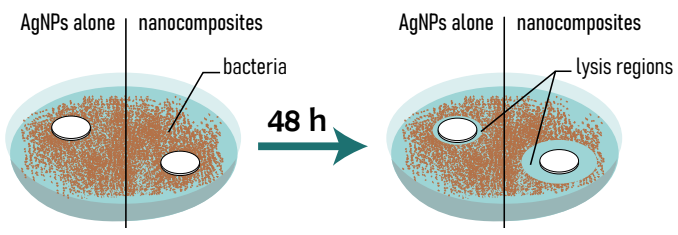
Ag^+ attaches to cellulose nano crystals and with the aid of a reductor forms nanoparticles on this structure.



This strategy allows to **create nanocomposites with well controlled composition**.

Biocide properties of these nanocomposites

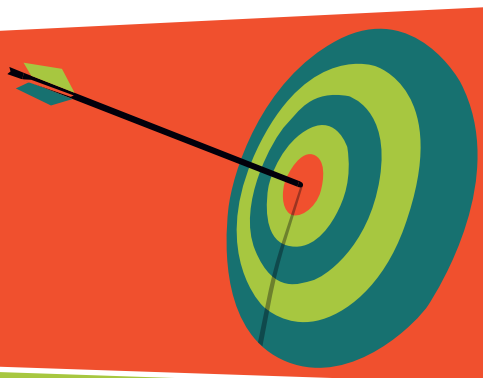
Synthetized nanocomposites have been put in contact with a bacteria: *Bacillus subtilis*. Their biocide effect have been compared to AgNPs alone.



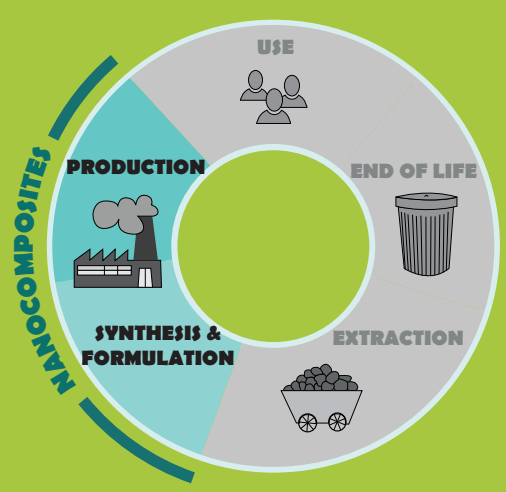
After 48h, the lysis regions (the areas where the bacteria were killed by Ag^+) have a different extend. **The biocide effect of nanocomposites is more important than AgNPs alone.**

Biocide nanocomposites with controlled sizes and shapes **have been synthetized.**

These optimized nanocomposites are an improvement compared with AgNPs alone. They **limit the release of Ag^+** and are **efficient biocides**.



LIFE CYCLE STAGES STUDIED



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Serenade
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