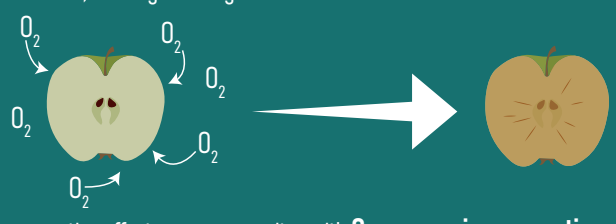
A nanocomposite to increase the shelf life of products

FOOD OXIDATION

Dioxygen (O_2) **negatively affects** the **quality** and **shelf life** of many food products through **oxidation**, leading to a huge loss of food.



To limit these negative effects, nanocomposites with **O_2 scavenging properties** are very promising.

WHAT ARE NANOCOMPOSITES FOR FOOD PACKAGING?

NANO

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

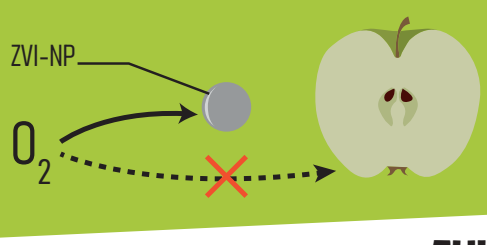
NANOCOMPOSITE

Here, a nanocomposite is **the dispersion of ZVI-NPs in a matrix.**

WHY USE ZVI-NPs?

Zero **V**alent **I**ron **N**ano **P**articles

These **metallic nanoparticles will react with O_2**. This will prevent food oxydation and improve the shelf life of the product.



A WIDE RANGE OF APPLICATIONS

Biocompatible properties of ZVI-NPs enable them to have many potential uses:

Water purification

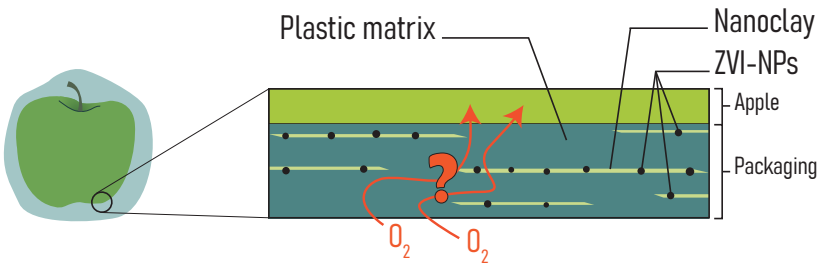
Food packaging

Health care

ZVI-NPs AS O_2 SCAVENGERS

ZVI-NPs have **scavenger properties**, they can be synthetised and then dispersed within nanoclay in the whole packaging to limit O_2 diffusion:

- **physically**, nanoclays playing the role of obstacles on packaging,
- **chemically**, ZVI-NPs are oxydized instead of food.



Can ZVI-NPs efficiently prevent the diffusion of O_2 through food packaging?

OBJECTIVE

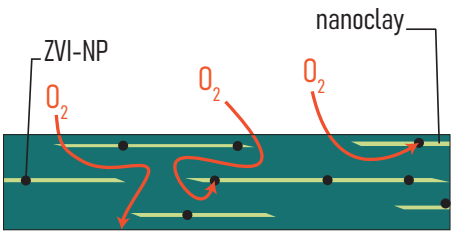
Investigating **different** nanocomposites based on ZVI-NPs to design new food packaging to increase the product's shelf life.

SOME RESULTS OF THE PROJECT

The presence of nanoclay in food packaging slows down the diffusion of O_2 towards food. In addition, the presence of ZVI-NPs allows O_2 adsorption to further increase product's shelf life.

ZVI-NPs combined with nanoclay support

Analysis of O_2 adsorption on a **ZVI-NPs/nanoclay** food packaging.



Adsorption speed:* **0.02** mg d'O_2/min/g of film

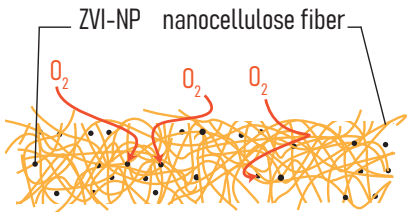
Size of ZVI-NPs: **30 nm**

*O_2 adsorption speed has been analysed for the first 30 min.

ZVI-NPs are **efficient,** they **limit** the amount of O_2 diffusion within the packaging and the **O_2 adsorption is stable over time.**

ZVI-NPs combined with nanocellulose fibers

Analysis of O_2 adsorption on a **ZVI-NPs/nanocellulose** food packaging.

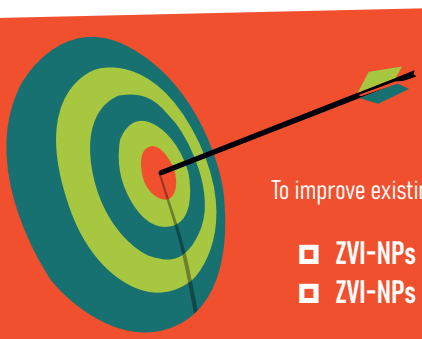


Adsorption speed:* **0.4** mg d'O_2/min/g of film

Size of ZVI-NPs: **13 nm**

*O_2 adsorption speed has been analysed for the first 30 min.

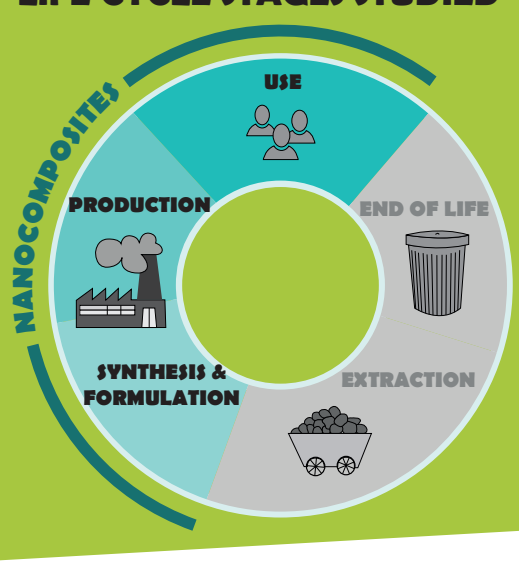
ZVI-NPs are **more accessible when dispersed in a thin self supported film of nanocellulose fibers.** However, the **O_2 adsorption appears as less efficient over time**.



To improve existing packaging, the **addition of O_2 scavengers** such as ZVI-NPs really **decreases food oxydation**:

- **ZVI-NPs + nanocellulose** allow a faster adsorption of O_2 but limited in time, usable for **short term applications**,
- **ZVI-NPs + nanoclay** provide a slow adsorption of O_2 which lasts over time, usable for **longer term applications**.

LIFE CYCLE STAGES STUDIED



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Serenade
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