THE TECH TRANSFER OFFICE
UNIVERSITY OF COPENHAGEN

On Demand-release of Micronutrients to Plants

- From deficiency to efficient supply of micronutrients

Source: Unsplash, Martin Oslic

For further information, please contact Senior Commercial Officer
nien@adm.ku.dk, +45 28 75 63 30 (Mobile), +45 3532 63 30 (Office)
Case number: 521-0305/15-7000

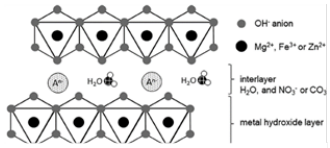
Background

Deficiencies of micronutrients such as Zinc (Zn) and Manganese (Mn) is a major problem in many parts of the world. Zinc (Zn) deficiency ranks fifth among the most important health factors in developing countries, and causes yield reduction and decreased shelf life of post-harvest products.

Thus, there is need for a robust new fertilizer technology whereby micronutrients are supplied to plants in a rate comparable to uptake of the nutrients.

The Invention

The Invention relates to the use of layered double hydroxides (LDH) whereby cations (such as Zinc or Manganese) are bound by between the two layers. The micro nutrients are released when the LDH structure dissolves in water due to change in Ph. Layered double hydroxides (LDH) are 2-D nanostructured synthetic materials with ion exchange consist of alternating layers of positively charged metal hydroxides and interlayers of charged compensating anions. The cations are typically Mg2+ and Fe3+/Al3+, but others can also be substituted into the metal hydroxide layers including Zn2+, Cu2+, and Mn2+ and Mn3+.[1]



*Figur **Fejl! Ingen tekst med den anførte typografi i dokumentet.** Structure of Layered Double Hydroxide (see ffotnote 1.*

Key selling points

- Release on demand LDH can act as coating agents for regular macronutrients fertilizers
- Efficient supply of micro-nutrients, especially on non-acidic soils
- Reduce or eliminate need for foliar application of micronutrients
- Low leaching of micronutrients to the environment
- Can be manufacture of available materials based on known technology

Development status

Proof of concept has been obtain under green-house controlled conditions in pots with 6 different layered double hydroxides comprising (Mn, Zn, and Cu), i.e. two different LDH. The LDHs were sprayed into fertilizer granules of ammonium sulfate and commercial available BPK fertilizer. It has been shown that the synthesized LDHs may be used as coating agents for regular macronutrient fertilizers and have the ability to supply micronutrients to plants over weeks and even months after soil application[2].

Intellectual property rights

An EP patent application number 17701989 was filed 1st September 2017 with earliest priority date 8th January 2017.

---

[1] Layered double hydroxides: potential release-on-demand fertilizers for plant zinc nutrition
López Rayo, S., Imran, A., Hansen, Hans Chr. Bruun, Schjørring, Jan K. & Magid, Jakob, 2017, In Journal of Agricultural and Food Chemistry. 65, 40, p. 8779-8789 11 p

[2] Novel control-release fertilizers based on layered double hydroxides for manganese nutrition
López Rayo, S., Hansen, Hans Chr. Bruun, Schjørring, Jan K. & Magid, Jakob, 2017, Proceedings Book: XVIII International Plant Nutrition Colloquium with Boron and Manganese Satellite Meetings. Carstensen, A., Laursen, K. H. & Schjørring, J. K. (eds.). University of Copenhagen, p. 935-936 2 p