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## Nanostructured Vermiculite – A new material for recycling ammonium from different types of polluted matters

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We present an original patented technology that involves modifications applied to the crystalline lattice of the natural mineral vermiculite. This modification occurs at the nanolevel that varies from 0.4 – 0.7 nm up to hundreds of nm, in terms of the cell size and clusters of the crystals, respectively. The present project aims to obtain a brand-new, high-tech geomaterial GS-1, which can be used as an efficient filter and immobilizer of ammonium ion ( $\text{NH}_4^+$ ) from variable polluting matters (waters, soils, excrements, etc). A secondary product, ammonium-doped modified geomaterial termed herein GS-2, can be obtained during operations related to cleansing of the polluted environment. GS-2 thus becomes an ecologically sound fertilizer for long-term period use and a soil conditioner. All the methods and products related to this development are novel, environmentally friendly and concerned with recycling.

The geomaterial GS-1 is able to absorb up to 4.7 wt% of  $\text{NH}_4^+$  into the A-site of its crystal lattice over a short time span. Such absorption is selective since other cations hardly get absorbed though they can have a similar size and charge. Such selectivity opens various prospects for the use of GS-1 as a unique  $\text{NH}_4^+$  absorber for various polluted environments. Our material has been efficiently tested on waste water from a biogas plant, human urine, combustion experiments (fox excrements), industrial chimneys, excrements from farms etc. Moreover, the ammonium-doped secondary geomaterial GS-2 was tested as a fertilizer in greenhouse experiments with seedlings. After five months, the weight of the plants that had grown in a substrate containing geomaterial GS-2 was 10 times the weight of plants growing in the reference substrate. More longer and representative tests are currently in progress to establish the ideal proportions of both geomaterials for their best efficiency.

These test results together with latest marketing research are currently used for a commercialization project in Europe. The unique aspect of GS-1 for reduction of polluting  $\text{NH}_4^+$  and its reuse as a fertilizer (GS-2) for increased growth has very significant business potential.