

EMBARGOED UNTIL 14 JULY 2017

**Applied Nanoparticles announces availability of BioGAS+ (beta version)**  
***Unique trace element additive for the optimisation of anaerobic digestion***

**Barcelona, 14 July 2017.** In a new step from laboratory to market, with the purpose of making nanotechnology real, Applied Nanoparticles SL announces the availability of their patented, registered and unique product, BioGAS+, that obtains the highest ever-reported improvement of biogas production, among many other differential advantages<sup>1</sup>.

The trace element additive BioGAS+ contributes directly to the metabolism of microbiota. Based on innocuous iron oxide nanocrystals that dissolves at the demand of archaea in order to boost their metabolic activity, increasing thus biomethane production and keeping a healthy consortium stabilizing your process. The increased biomethane production is concomitant with a reduction of the digestate volume and its chemical potential (reactivity), and the final digestate is enriched in iron ions, being a better fertilizer. Increased anaerobic digestion also translates into an increased sanitation and process acceleration. Additionally, iron ions precipitate S and P species and attenuates pH variations. Interestingly, BioGAS+ has been observed to promote the degradation of recalcitrant matter and rescue of “sick digesters”. The ability of nanoparticles to absorb tensioactives resulting on reducing foams has been also observed. This is a paradigm shift in the prevalent solutions for optimization of biogas production. BioGAS+ is developed under the principles of Responsible Research and Innovation (RRI)<sup>2</sup>. The technology is safe and environmentally friendly, contributing to sustainable energy production and waste management. It produces not only greener energy but also greener digestate (ready to be compost). **Anaerobic Digestion will never be the same.**

**BioGAS+**  
BIOGASPLUS.INFO

**60 €\***



**By APPLIED NANOPARTICLES**

\* TAXES AND SHIPMENT NOT INCLUDED  
The orders of the product may be made from September (all details will be explained in BioGAS+ website: <https://biogasplus.info>), they will enjoy of a special beta version price and will be served in a *first in, first out* basis.

<sup>1</sup> Programmed iron oxide nanoparticles disintegration in anaerobic digesters boosts biogas production. *Small*, **2014**, 10, 2801-2810.

<sup>2</sup> <https://innovation-compass.eu/wp-content/uploads/2017/04/AppNPs-Final.pdf>

Recently, there has been a general turn in the European Union towards green energies (the one that started with the “Energiewende”). Governments are pushing for renewable energy infrastructure and production. By 2020, 20% of the energy consumed in the EU will be renewable (2009/28/CE).

When we first observed the effects of Fe<sub>3</sub>O<sub>4</sub> nanoparticles (NPs) in anaerobic digesters we did not really realize what was happening. We were studying the inhibition potential of inorganic NPs and their toxicity to anaerobic consortia in wastewater treatment plants (WWTPs) in the framework of a research project of the Spanish *Ministerio de Medio Ambiente y Medio Rural y Marino*, where biogas production/inhibition was an endpoint to test NP toxicity. Our results published in *Journal of Hazardous Materials*<sup>3</sup> and *Small* showed that non silver or gold or TiO<sub>2</sub> NPs had any negative effect, CeO<sub>2</sub> NPs produced inhibition of biogas production likely due to the Ce<sup>3+</sup> ions, and an increase of production in the case of Fe<sub>3</sub>O<sub>4</sub>. Indeed, an external colleague was who pointed it out saying: “Hey guys, you are triplicating biogas production! This is way above anything I have ever seen!”

This let us confused for a while. It could be an artifact, but normally, when something goes experimentally wrong, you get less biogas, not more...Then we started reproducing the experiment, developing models and adding controls until the phenomena was slightly understood (so we could take a direction to evolve): ***Dosing at the Nanoscale***.

*Dosing at the nanoscale* is a principle translated from current pharmacology and drug delivery technology. For example, to treat ferropenic anemia in some conditions, patients are injected large amounts of pre-biotic (mineral) iron (amounts that in the ionic form would be toxic) that slowly transform inside the body into Fe<sup>2+</sup> biologically beneficial ions. BioGAS+ is an analogue approach to treat the *endemic* ferropenic anemia of archaea.

Once the trail was drawn, things speeded up: getting a patent, looking for and obtaining funding, scaling up the production of the NPs, scaling up the application of the NPs; and doing it all under safety by design and RRI principles. After the initial academic research we obtained funding from the *Bill and Melinda Gates Foundation*. A Patent was deposited in Europe by patent application 12707361.7.1352 Ref. [P1923EP01/EP2683662](#) and in the USA by patent application [nr. 14/004.646](#) and publication nr. 2014/0017753. Priority Data: 11/03/2011. We were given a *Secretaria General Iberoamericana* prize in 2013. Our description of the observed phenomena was accepted for publication in the specialized journal *Small*<sup>1</sup>. In 2013 the patent was made public. Then we obtained strong support from Repsol Foundation for two years incubation and we succeeded in industrializing the production of our nanoparticles and moving our biogas production tests from batch to semicontinuous pilots replica of anaerobic industrial digesters.

**Today, the world of biogas is big and complex We need co-developers, indeed. We hope that we will create a community of optimized AD where NPs can play many beneficial roles. Therefore, we are selling it at production costs and at amounts dimensioned for research purposes.**

We will **start accepting orders in September 2017** (all details will be explained in BioGAS+ website: <https://biogasplus.info>), they will enjoy of a special beta version price and it will be served in a *first in, first out* basis.

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<sup>3</sup> Effect of cerium dioxide, titanium dioxide, silver, and gold nanoparticles on the activity of microbial communities intended in wastewater treatment *Journal of Hazardous Materials* **2012**, 199, 64– 72.

Recently, [Víctor Puentes](#), nanoscientist and founder of [Applied Nanoparticles](#) said:

*“BioGAS+ is the result of intensive research that started in 2008 under the principles of Responsible Research and Innovation and will be marketed from next summer. Applied Nanoparticles offers the trace element supplement BioGAS+, a patented and registered nanotechnology-based innovation, that obtains the highest ever-reported improvement of biogas production. BioGAS+ contributes directly to the metabolism of microbes, with the doses of innocuous and bioavailable iron that needs the microbe at each moment. This is a paradigm shift in the prevalent solutions for optimization. The BioGAS+ enhancement lies on nanomaterial specifications, rather than material composition, a field which we dominate. We feel inaugurating the nanomicrobiology era. Anaerobic Digestion will never be the same.”*

### **About Applied Nanoparticles SL**

[Applied Nanoparticles SL](#) (AppNPs) is a technology-based spin off company derived from the Universitat Autònoma de Barcelona (UAB), the Institut Català de Recerca i Estudis Avançats (ICREA), and the Catalan Institute of Nanoscience and Nanotechnology (ICN2). The company was founded on October 17th 2013. The company's purpose is to research, study and develop nanoparticles and their applications. This includes design, production and characterization of nanoparticles, consultancy activities and dissemination, as well as training and education in nanoscience, nanotechnology, and related areas under principles of [Responsible Research and Innovation](#). AppNPs core project is the commercial exploitation of a EU-US patent, *BioGAS+*. AppNPs ultimate aspiration when developing *BioGAS+* is to transform waste into appealing raw materials in an efficient and sustainable way while contributing to key policy objectives, such as climate change targets, energy and food security, resource efficiency, improved air quality, the bioeconomy, bioenergy, the prevention of contamination and develop circular economy. You can find out more information from our website: <https://www.appliednanoparticles.eu/>

### **Context**

We have chosen this date, 14 July, as our humble homage and recognition to the Age of [Enlightenment](#).

Jeff Bezos started walking to the post office to delivery his first packages, right? *“Amazon started as a very small company. I was driving all the packages to the post office myself.”* Jeff Bezos

<https://www.youtube.com/watch?v=LqL3tyCQ1yY>

### **Contact**

To learn more about this announcement, please contact [info@appliednanoparticles.eu](mailto:info@appliednanoparticles.eu)

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