Production process of protected oxidizable metallic particles and correspondent products.

KEYWORDS

- ❑ NANOPARTICLES
- ❑ MICROPARTICLES
- ❑ PROTECTION
- ❑ INCLUSION
- ❑ CRYSTALLIZATION

AREA

- ❑ NANO-TECHNOLOGIES & MATERIALS

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Patent Type
Patent for invention.

Ownership
Sapienza University of Rome 100%.

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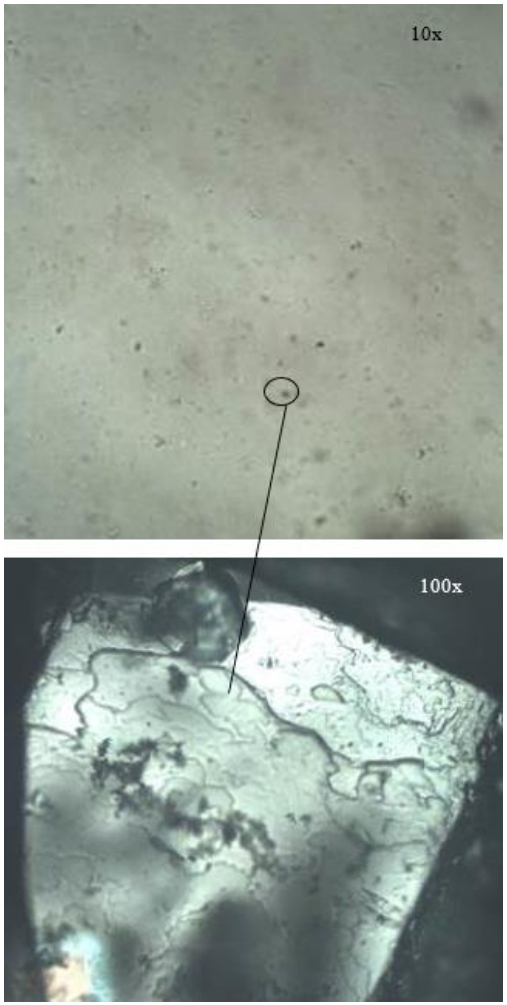
Industrial & Commercial Reference
Micro- and nanotechnology industry (environment, cosmetics, pharmaceutical, nutraceutical, biomedical, catalysis).

Time to Market
Methodology and experimental work accomplished, consolidated technology.

Availability
Licensing, Research, Develop-ment, Experimentation, Collaboration, Start-up and Spin-off.



Magnification of the nanoparticles (of metallic iron) in the crystallized saline protective matrix (potassium sulphate).

Abstract
The patent concerns a new methodology to protect chemically active micro- and nanoparticles from the environment.

The protection allows to obtain a highly preservable product over time, without varying the chemical-physical characteristics.
The storage of the material takes place at solid state, without the need of inert atmospheres and capping liquids.

The soluble protection is quickly removed during the use of the material.
The particles are therefore immediately available for the specific process.

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Technical Description

The patent refers to a process for the production of submicronic particles and oxidizable nanoparticles consisting of one or more zerovalent metals and protected in a crystallized solid matrix.

In particular, the patent refers to a process in two successive fundamental phases:
(1) synthesis of the metal particles in solution;
(2) crystallization by heterogeneous nucleation of the solute on the produced particles, that serve as a seeding.

The invention also relates to oxidizable metal particles protected by a crystallized solid matrix coating directly obtained with the method of the invention and to the relative uses of said particles in the industrial and environmental field.

Technologies & Advantages

1. The coating process is simple to implement, and can be applied in any laboratory, private or university, or on an industrial scale, with simple and inexpensive equipment.

2. The coating does not alter the oxidability of the produced particles.

3. The coating preserves the particles from their oxidation during the storage and transport phase, immediately upon their production.

4. The coated particles may be stored in the mother liquor of production, or further processed into solid state by vacuum evaporation and / or other separation techniques from the mother liquor, without the need for special operational precautions unless the residual supersaturation is maintained during the procedure.

5. The process can be performed avoiding the use of toxic, carcinogenic or mutagenic reagents, and without the use of particular safety protocols.

6. The coated particles can be stored at room temperature in any place, provided they are not in contact with the solvents of the protective crystallized solutes.

7. The transportation of the solid particles is extremely facilitated because of reduced volume and does not require specific measures to prevent oxidation during transport from the place of production to the place of use (if these do not coincide).

8. A reactivation of the particles before their use is not necessary; condition for their release is the presence of one or more solvents able to dissolve the layer, in most cases water.

9.The dissolution of the crystallized protective layer may represent a value-added substance entry in specific application fields.

10. The thickness of the protective layer and the dissolution kinetics in the specific solvent determine the release time of the nanoparticles, which can therefore be suitably designed for controlled release applications, both in terms of time and space (carrying).

11. The method proposed here is overall sustainable from an environmental, technical and economic point of view.

Applications

Protection, stable storage and facilitated transport of micro- and nanoparticles of:

1. catalysts;
2. fertilizers;
3. drugs;
4. nutraceuticals;
5. pigments;
6. cosmetic;
7. chemical reactants for environmental treatment and remediation;
8. biomedicals.

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