 Manufacture of a new generation of nickel-based catalyst (recovery of a residue from titanium metallurgy)

**Background**
A process for manufacturing a nickel-based catalyst has been developed to upgrade the UGSO residue from a manufacturer of titanium dioxide located in Sorel-Tracy. This new generation of catalyst will be able to substitute nickel-based catalysts currently available on the market serving, among other things, for the manufacture of hydrogen.

This invention is in a very favorable context because there is a current craze for sustainable development and the implementation of clean technologies. In fact, the production of hydrogen (H2), a vector of sustainable development both in terms of materials and energy, is closely linked to catalysts. In addition, the use of catalysts follows a growing trend. As an indication, in 2012, the use of catalysts in the oil sector represented a figure of 5.6 billion USD (for a global market of 16 billion USD), including 320 million USD for reforming catalysts. In 2016, the same market was measured at 6.60 billion USD and is expected to reach 7.98 billion USD in 2022, with a compound annual growth rate of 3.2% between 2017 and 2022.

**Description**
The invention consists of a new high value product, the Ni-UGSO catalyst, and a method for converting the UGSO residue to Ni-UGSO catalyst. This method is an improvement to the spinellization process. Here are the main points of the overall process:
- Process for the preparation of Ni-UGSO: a quantity of nickel (Ni), via a precursor, is added to a mass of the mining residue (UGSO) and to a binder. The mixture of the reactive elements is then subjected to a heat treatment.
- The Ni-UGSO obtained can be used, inter alia, as a catalyst in reforming processes. The catalytic mass is deposited in a heated fixed bed reactor. The reactants whose flow rates are pre-adjusted, react more rapidly in the presence of the catalyst thus giving a synthesis gas rich in H2.
- Regeneration of catalysts: the calcination under oxidizing atmosphere allows the catalyst to recover its initial structure. The H2 production results with the new Ni-UGSO catalyst at the laboratory scale demonstrate a performance similar to or better than the synthetic catalysts currently on the market at a fraction of the cost of the latter (about 50% less expensive).

**Possible Applications**
The new nickel catalyst can be used in a variety of processes currently using synthetic nickel catalysts, such as:
- Processes for the production of syngas or hydrogen (from natural gas or other hydrocarbons by dry reforming (DR), steam reforming (SR), partial oxidation (POX), autothermal reforming (ATR: Autothermal reforming), reforming of pyolytic oils.
- Any other industry requiring more efficient and competitive nickel-based catalysts (or other active metals) (eg, petroleum refining, hydrotreatment, hydrodesulfurization, hydrodenitification, isomerization, hydrodeoxygenation, hydrodemetallization, hydrocracking, selective oxidation).

**Business Advantages of this solution**
- Cost and efficiency: 50% of the cost of the next competitor while being as good or better.
- Market share: the entire tonnage of the UGSO residue could fill 17% of the global H2 market.
- Increased catalyst life and regenerability: lab scale results have so far shown that the catalyst is stable and can be easily regenerated by oxidation.

Why this invention is an industrial opportunity
- Valuation of a residue currently disposed in the park.
- Proof of concept is made.
- Residuals unique to this manufacturer of titanium dioxide located in Sorel-Tracy.
- High value added products.
- Growth of the global catalyst market.
Intellectual Property Status
PCT / CA2016 / 050844

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