



CATALYST FOR OXYGEN REDUCTION REACTION AND OXYGEN EVOLUTION REACTION AND METHOD FOR MANUFACTURING OF THE SAME

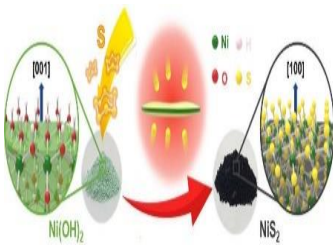
Affiliation : Korea university

Type of Partnership : Open for negotiation

Cost : Open for negotiation

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<The image showing manufacturing method of catalyst for oxygen reduction reaction and oxygen evolution reaction>

Abstract

It is related to synthesize NiS_2 nano-sheet of a two dimension and utilize as a catalyst for lithium air cell.

Problems with Existing Technology

It has to solve the problem of the existing energy storage technology according to the depletion of fossil fuels and high oil price.

- Lithium air cell which use lithium as cathode is considered as having the highest energy density among the next generation secondary cell batteries.
- In order to reduce the overvoltage between the oxygen reduction activity and oxygen evolution reaction, it usually utilizes the metals. However, the manufacturing cost is expensive. Thus, it needs to improve the technology of a low-cost catalysts with high-activation and high stability.

Technology Readiness Level

TRL 2 : Technology Concept formulated

TRL1	TRL2	TRL3	TRL4	TRL5	TRL6	TRL7	TRL8	TRL9
Basic Technology Research	Technology Concept formulated	Experimental Proof of Concept	Technology validated in lab	Technology validated in relevant environment	Technology demonstrated in relevant environment	System Prototype in operational environment	System complete & qualified	Full commercial application

Differentiation and Effect

Differentiation

A Manufacturing method of the catalysts of oxygen reduction activity and oxygen evolution reaction

- The ammonia solution can be added by Ph 9~ 11 in the manufacturing phase of mixture.
- It can be hydrothermal synthesized in 160 ~ 210 °C.
- Through the heat treatment, the sulfur and nano-sheet of $Ni(OH)_2$ precursors is able to have a chemical reaction

Effect of Technology

Catalysts with NiS_2 nano-sheet

- It can be used as the functional catalysts of oxygen reduction activity and oxygen evolution reaction
- Low-cost catalysts with high-catalytic activity
- It has catalyst active area with two dimensional structure of nano-sheet through structural control.
- With a simple process, it can produce in a large amount. Thus, it is expected to contribute to commercialization of lithium-air battery.

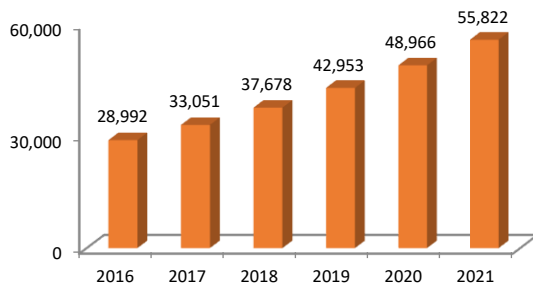
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Technology Application Field

It can be used in a various field such as new renewable energy storage.



Market Trends



MOTIE, navigant research

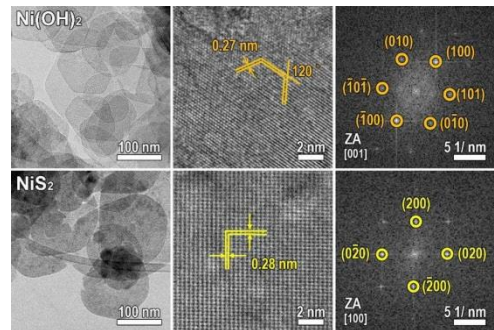
<Global Energy storage market, million USD>

- Energy storage market is expected to grow significantly according to increasing of electricity demand and spreading of new renewable energy.
- Energy storage market is expected to grow from USD 28.9 billion in 2016 to USD 55.8 billion in 2021.

Technology Implementation

Synthesis method of precursor of Ni(OH)₂

- Producing different kinds of mixed solution among the range of Ph 9~12, adding ammonia solution after dissolving 0.08 mol of nickel acetate in a 100ml solvent.
- Increasing the temperature by 10 °C in the range of 140~200 °C respectively and hydrothermal synthesizing for 4-12hours at a one-hour interval.
- After completing the reaction, cleaning it with water and ethanol, drying and synthesizing the precursor of Ni(OH)₂.



<The image of Ni(OH)₂ precursor and NiS₂ catalyst, high resolution image of TEM and FFT>

List of related patents

No.	Title of Invention	Patent No./ Application No.
1	CATALYST FOR OXYGEN REDUCTION REACTION AND OXYGEN EVOLUTION REACTION AND METHOD FOR MANUFACTURING OF THE SAME	-