METHOD FOR RECYCLING OF VESSELS AND OTHER STRUCTURES COMPOSED OF FIBERGLASS AND RESIN

PATENTED TECHNOLOGY

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ABSTRACT

Researchers at the University of Alicante have developed a method to recycle composite fiberglass structures on a polymer matrix (resin). The process removes the polymer matrix, recovering glass fiber which can be reused.

The process is not aggressive with fiberglass. It takes place at room temperature and is able to recover all the fiberglass used. The method is industrially scalable and can be automated.

Fiberglass composites and resin are widely used in the construction of boat hulls, tanks, wind turbine blades and many other applications. This method is a very important innovation for the sector and there was no effective method that allowed recovering and reusing these materials.

INTRODUCTION

The structures incorporating fiberglass to a polymer matrix are light, durable and easy to mold. It has also good resistance to corrosion and wear.

Thanks to these features it is widely use in shipbuilding, automobile or aircraft industry where is necessary to build elements of soft shapes with a high resistance.

Currently, one of the main applications is the construction of boat hulls, which is the main material in pleasure boats.

However, a problem arises when recycling this material once the life of the ship finishes. There is no optimal process that separates again fiberglass and resin. Finding a final destination of the large number of vessels removed is a major environmental problem to solve in the sector.

Left. Fiber-resin composite material before fiber recovery treatment.
Right: Fiberglass recovered after chemical treatment.
Center: degraded resin residue after the chemical treatment.

Current recycling techniques follow the following options:

- Shred the composite material and reuse it into new polymer matrixes. The final product obtained has several applications but has lower quality than initial material.
- Pyrolysis of materials. This process allows the removal of the resin and energy production, but is highly polluting and degrades the glass fibers.
- Separate the material by hydrolysis. This method does not allow glass fibers separation easily and they get degradated during the process.
- Separate resin fiberglass. There are systems of separation by chemical processing at high temperatures, but these are not fully effective. They achieve a recycle rate of 80% of all the material.

In conclusion, current methods are aggressive towards the materials and not a total separation to facilitate their reuse is achieved.

TECHNICAL DESCRIPTION

The method developed by the research team at the University of Alicante overcomes the previously stated drawbacks.

By a chemical process the separation of the glass fibers from the polymer matrix is completely achieved. This process is performed under soft conditions of pressure and temperature so that the fibers do not degrade and can be reused in new construction processes.

The process is relatively simple and consists of three basic steps:

- Separation of other materials that can be incorporated, such as wood or metal.
- Chemical treatment of the composite material under conditions of temperature and specific pressure.
- Separation of fiberglass resin debris by sieving.

The process is scalable industrially and is able for being automated. Chemicals used in the process can be recovered and can be reused in consecutive cycles.

ADVANTAGES AND INNOVATIVE ASPECTS

ADVANTAGES OF THE TECHNOLOGY

- Fiberglass recovering without degradation, allowing reuse.
- The process is performed under soft conditions of pressure and temperature.
- The method is economically very profitable (the chemical process energy cost is low and the necessary reagents are not expensive).
- Possible scaling up of the process.
- Applicable to a large number of products formed by resin and fiberglass.
- The method devised, unlike other processes, does not involve highly polluting emissions into the atmosphere.

INNOVATIVE ASPECTS OF THE TECHNOLOGY

The technology is very innovative at a global scope because there is not in the market any optimum solution solving the problem of composite fiberglass and resin recycling.

The process is not aggressive and allows to separate and recover 100% of both materials. It represents an ideal way for recycling the huge volume of material that is removed daily in the world.

CURRENT STATE OF DEVELOPMENT

The procedure has been tested at a laboratory scale obtaining very satisfactory results.

The scaling of the chemical process would be simple and could be easily implemented.

MARKET APPLICATIONS

The main area of application is ship recycling. Vehicles are large and when they fulfill their life, there is not any definite destination for removal. Currently there is no economical process to recover this material.

In addition to the marine industry of the compounds of resin with glass fiber other uses can be found. They are used in the aerospace and automotive sectors for manufacturing vehicle parts. It is also a building material used in buildings, bridges, pipelines, insulation, railings, marine stairs, deposits, etc. Recently its use has spread to other sectors as in the manufacture of sports equipment (skis, surfboards, canoes, poles, arches, etc.).

COLLABORATION SOUGHT

Companies interested in acquiring this technology for commercial exploitation are sought The following cooperations can be offered:

- License agreements patent.
- Development of R & D sets to adapt the technology developed to the needs of the company.

- Technical cooperation, subcontracts and advice on R & D.

INTELLECTUAL PROPERTY RIGHTS

This technology is protected by **granted patent**.

- Title of patent: "Method of inorganic fibers at room temperature fiber-resin composites." / "Procedimiento de fibras inorgánicas a temperatura ambiente en materiales compuestos fibra-resina".
- Application Number: 201531174
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MARKET APPLICATION (4)

Construction and Architecture
Pollution and Environmental Impact
Materials and Nanotechnology
Transport and Automotive