

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

### DESCRIPTION OF THE TECHNOLOGY

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.

This method is a very important innovation for the sector and there was no effective method that allowed recovering and reusing these materials.

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 used in shipbuilding, automobile or aircraft industry where it 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.

Current recycling techniques follow the following options:

- Shred the composite material and reuse it into new polymer matrices. 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 degraded 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.

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:

1. Separation of other materials that can be incorporated, such as wood or metal.
2. Chemical treatment of the composite material under conditions of temperature and specific pressure.
3. 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.

### MARKET APPLICATION SECTORS

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.

### TECHNICAL ADVANTAGES AND BUSINESS BENEFITS

- Fiberglass recovering without degradation, allowing reuse.
- The process is performed under soft conditions of pressure and temperature non aggressive for fibers.

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- 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.

### 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.

### INTELLECTUAL PROPERTY RIGHTS

This technology is protected by patent application. Title: "Method of inorganic fibers at room temperature fiber-resin composites". Application Number: 201531173. Application date: 08/06/2015

### COLABORATION 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.

### RELATED IMAGES

**Left:** Fiber-resin composite material before fiber recovery treatment.

**Center:** Degraded resin residue after the chemical treatment.

**Right:** Fiberglass recovered after chemical treatment.



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