LEONARDO

PATENT BROCHURE

A COMPOSITE MATERIAL WHICH IS SELF-REPAIRING EVEN AT LOW TEMPERATURE

Main Technological Area ⟶ Innovative Materials

Keywords ⟶ Self-repairing | Hoveyda-Grubbs catalysts | Composite materials | Multifunctional | Carbon nanotubes

Composite material having thermosetting polymer matrices capable of self-repairing even at very low temperatures, re-establishing the integrity of the matrix before the micro-cracks can propagate seriously compromising the integrity of the structure. The "self-repairing" material has improved chemical, physical and mechanical characteristics. Furthermore, the presence of nano-tubes in the matrix, in a quantity of between 0.1 - 5.0% by weight, improves the electrical properties of the material and makes it suitable for multifunctional applications.

TECHNICAL SPECIFICATIONS

Catalyst powders and microcapsules containing a reactive monomer which can polymerize and further reticulate are dispersed in the material matrix. When a crack which is forming in such material reaches a microcapsule, it therefore breaks the microcapsule, releasing the monomer. The latter polymerizes when comes into contact with the catalyst, then cross-links so as to block the crack and re-establish the structural continuity of the matrix. The reaction takes place even at low temperatures thanks to the properties of the catalysts used (called Hoveyda-Grubbs - see Figure 1). Experimental results have shown a very high self-repairing efficiency. In addition, the presence of conductive nano-fillers improves the electrical conductivity of the material.

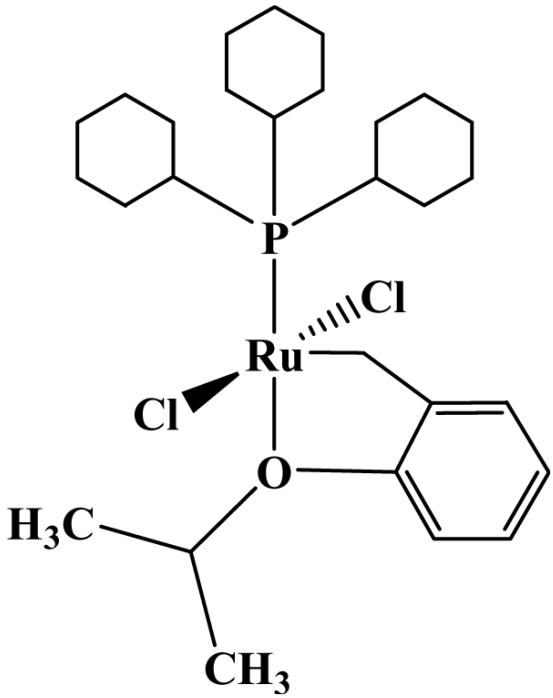

Figure 1 - Example of Hoveyda-Crubbs catalyst

INNOVATION/ADVANTAGES

The advantageous impacts of the patented method are:

- High speed repair mechanisms at all temperatures of aeronautical interest
- High dimensional control of the micro-capsules
- Reduction of maintenance costs
- Prolongation of structural integrity
- Weight reduction through increased material yield and permissible stress.

FIELDS OF APPLICATION

Structures	Innovative structures made with composite materials Multifunctional structures (e.g. having structural and electrical functionalities)

PATENT INFORMATION

Priority Date - 13/03/2008

Priority Code - IT TO200801984

IPC Codes – B29C 73/16 | B29C 73/22 | C08L 51/08 | C08L 51/00 | B01J13/18

Active worldwide applications

EPO - EP2257422B1; filing date: 11/03/2009; grant date: 10/07/2013

Extensions: Italy – France – United Kingdom - Sweden

Leonardo internal code

LDO-A437