NOVEL SELF-EXPANDING POLYURETHANE FOAMS INTENTED FOR INERT FILLING OF PLEURAL AND OTHER HUMAN CAVITIES

DESCRIPTION OF THE TECHNOLOGY

The Adhesion and Adhesives Laboratory of the University of Alicante has developed a new polymeric foaming material for *in-situ* filling and sealing of internal irregular different shaped human cavities, intended for patients suffering chronic pleural cavities and in-field injuries caused by bullets or accidental event leaving open blood vessels. The new foam is composed of two separate liquid components that can be mixed in a two-body syringe in such a way that the foaming time can be modulated for allowing the foam formation at the end of the syringe needle. The new polymeric foam can self-expanded and self-modelated for avoiding complications in open internal cavities caused by infections, blooding, fistulae, dyspnea or sepsis.

The new foam is easily applicable, safe for biological tissues, and its use avoid the use of the current aggressive treatments in pleural cavities.
University of Alicante has developed a new polymeric foaming material for in-situ filling and sealing of internal irregular different shaped human cavities, intended for patients suffering chronic pleural cavities and in-field injuries caused by bullets or accidental event leaving open blood vessels.
The new polymeric foams show a solid and a gas phase dispersed into the polymeric matrix, forming discrete or interconnected cells. The formation of in-situ the polyurethane foams is reached by mixing two liquid components that can be injected by means of a double-container syringe.

MARKET APPLICATION SECTORS

The present invention can be applied in the Biomedical and Veterinary for the filling of internal cavities. It can be also used in accidental and in-field lesions or injuries causing blood bleeding.

TECHNICAL ADVANTAGES AND BUSINESS BENEFITS

The new polyurethane foams show the following particularities:

- They are easy to apply, even throughout very small orifices.
- They are self-expandable and self-modelled as by controlling the time after mixing the two components and in the presence of moisture, they expand spontaneously, filing the cavity completely.
- They show null adhesion to the surrounding tissues, and their surfaces are impermeable.
- They have very low density (i.e. low weight).
- The foam can be extracted easily from the internal cavity.
- They are biocompatible and show low risk of tocixity, carcinogenesis and local clinical complications.
- They can be dosed into open or closed cavities.
- They can be applied in the presence of blood or biological liquids.
- The resulting foams do not deteriorate with time and are stable.

The new polyurethane foams can be formulated for rending flexible, semi-rigid or rigid foams, and in all cases, an homogeneous size and cell distribution is obtained, and all them show adequate mechanical resistance.

CURRENT STATE OF DEVELOPMENT

The technology has been developed at laboratory scale. A proof of concept has been tested for determining the viability of the new polyurethane foam in post-neumonectomy cavity in 20 Sprague Dawley rats and 6 rabbits.

Neumonectomy was carried out in each animal and the volumens of the cavities were determined. The two components of the new polyurethane foams were injected by means of a syringe into 1/3 of the cavity volume. Then, the thoracotomy was closed. Monitoring of the polyurethane foam was carried out by using X-ray equipment. After 3 months, the animals were sacrificed and the polyurethane foams were extracted and analyzed.

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The analysis of the extracted polyurethane foams show the following evidences:

- The foams filled completely the cavity and they were adapted perfectly to the pleural cavity of the animals.
- The mechanical integrity of the foams was maintained and it was excellent.
- Ipsilateral displacement was not observed.

INTELLECTUAL PROPERTY RIGHTS

The present invention is protected by patent application:

- Title: "Uso de espumas poliméricas autoexpansibles para el relleno de cavidades pleurales persistentes".
- Application number: P201531167. Date: 5th August 2015.

COLABORATION SOUGHT

It is looking for companies interested in acquiring this invention for commercial exploitation through the following ways:

- License agreement of the patent.
- In search for financial opportunities to develop new applications, adapt them to specific needs of the company, etc.
- Agreements for technology and knowledge transference.
- Technical reports and scientific assessment.
- Offer specific training depending on the companies needs.
- Standardization services, calibration, national and international technical rules, etc.
- Offer technological support on those technologies that require high preparation or sophisticated instruments that are not in the companies grasp.
- Staff exchange for specific periods of time (to learn specific techniques).
- Rent the internal equipment to clients that wish to continue their own tests (the infrastructure of the Department of Inorganic Chemistry – Adhesion and Adhesives Laboratory - or the Technical Services of Research of the University of Alicante (SSTTI)).

RELATED IMAGES

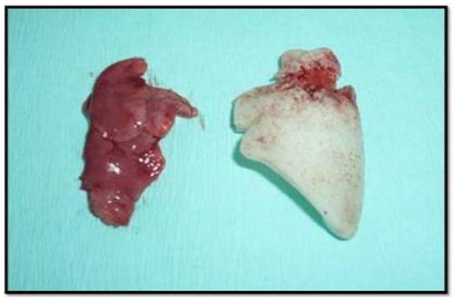

Image 1: Photo of left lung of Sprague Dawley rat. The excellent adaptation of the polyurethane foam to the pleural cavity can be noticed.

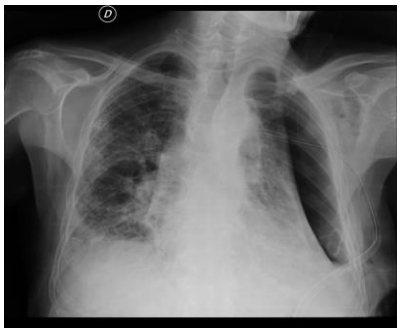

Image 2: Radiography of chronic pleural cavity

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