

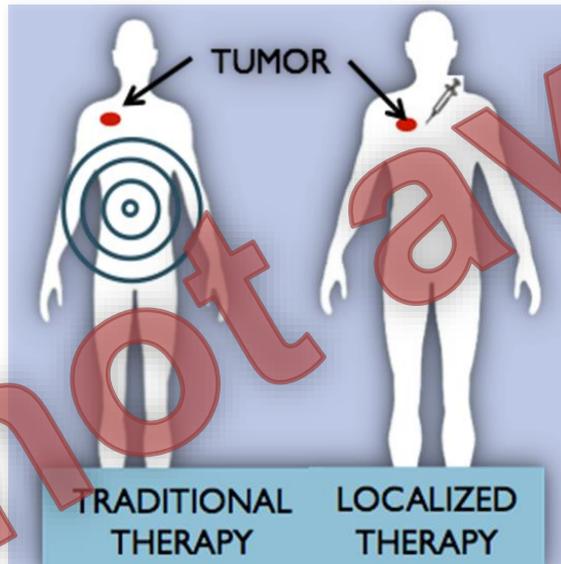
# Injectable polyurethanes for biomedical application

## Abstract

The proposed invention describes a technology for the design of polyurethane formulations in liquid state at room temperature, which can easily encapsulate active pharmaceutical ingredients. Upon injection in the body, they form a gel from which the drug is released in a controlled and localized fashion. The injectable polymers can also be applied in cancer treatment and cosmetic surgery as dermal and soft-tissue fillers.

Priority Number: TO2012A000669

Politecnico di Torino



injectable polyurethanes

tissue regeneration

cosmetic surgery

controlled drug delivery

sol-gel system

# Injectable polyurethanes for biomedical application



## Description

The current trend for therapeutic and cosmetic medicine is to perform surgery with less invasive techniques, in order to achieve good results with short recovery times whilst minimizing the size of the treated area. The injectable polyurethanes represent a promising alternative to existing drug delivery systems and cosmetic fillers. The invention describes a technology for the design of polyurethane formulations in liquid state at room temperature, which can easily encapsulate active pharmaceutical ingredients.

Upon injection in the body, they form a gel from which the drug is released in a controlled and localized fashion. Tests showed good injectability performance and the ability to retain the gel form at physiological temperature, while the histological studies showed no undesired alterations in treated issues. To date, the focus of many companies on lowering the side effects while increasing the longevity of aesthetic treatments at competitive prices, is expected to drive the growth of this market.

## Applications

The sol-gel polyurethanes can be injected with standard syringes and used as efficient carriers for different classes of bioactive molecules, such as antibacterial or anticancer drugs. The drug delivery system may be injected in situ, allowing for its localized and controlled release over time, with a reduction of side effects and the improvement of therapeutic outcomes. The invention can be used in the field of plastic surgery, as dermal and soft-tissue filler.

## Advantages

The targeted and controlled drug delivery holds a number of advantages over traditional systems and represents a good opportunity for many pharmaceutical and biomedical companies that are looking for strategic partnerships to improve their drug delivery strategies with new treatments able to maximize their effectiveness, while minimizing toxic side effects. The sol-gel polyurethanes exhibit considerable advantages compared to injectable medical polymers available on the market. Indeed, no chemical reactions are required to obtain

gelation in vivo and no potentially cytotoxic local temperature increase is observed after injection. The chemical structure of polyurethanes allows for a tailor-made preparation and offers the possibility to adapt the degradation rate of the sol-gel system to clinical requirements, while the synthetic origin eliminates the risk of disease transmission associated with the use of natural polymers. Additionally, the product can be sold in form of sterile powder for an easy packaging and distribution.