"MOLECULAR IMPRINTING OF POLYMER NANOPARTICLES: A METHOD AND APPARATUS" VCU #00-060

Applications

- A novel method and apparatus applied to nanoscale molecular imprinting for high species specificity
- Range of applications including:
  -drug delivery
  -polymeric traps for toxic gases
  -sensors

Advantages

- Can produce particles less than 50 microns in size that maintain uniformity
- Stable for long period of time (1-10 years)
- Binding sites are highly selective
- Improvement on current techniques by maintaining highly specific and homogeneous nanoparticles

Inventors

Gary Tepper,Ph.D.
Gary Wnek,Ph.D.
Natalia Levit,Ph.D.
Dmitry Pestov, Ph.D.

Contact

Wendy M. Reid, Ph.D.
Licensing Associate
wmreid@vcu.edu
Direct 804-827-2213

Market Need

Molecular imprinted polymers (MIP) can be applied to many different uses such as: drug delivery, polymeric traps for toxic gases, and sensors. These polymers employ a "lock and key" technique that targets specific molecules based on surface structure of the device. Typical methods utilize a template that allows monomers to assemble and crosslink which produces a device tailored to a specific molecule or class of molecules. Currently covalent and non-covalent interactions are implemented as techniques for producing MIPs. Even though these methods are common in molecular imprinting, they tend to have problems with homogeneity and accessibility which are integral functions with targeting specific molecules. Another method is solution polymerization in which the polymer is mechanically grinded to produce exposed sites. The downfall to this method is that grinding can produce an irregularly shaped structure which can affect the efficiency of molecular binding at all sites. In general, there exists a need for a method that can maintain uniformity and be highly selective for binding molecules to ensure that only the intended molecules bind to the surface.

Technology Summary

The method and apparatus is a technology that produces molecular imprinted polymers by expanding a mixture of monomers and propellant. As the mixture leaves the nozzle of the apparatus, the propellant causes the mixture to quickly expand to create fine particles of preferable size less than 50 microns. Through this process there are two embodiments, one being a structure composed of polymerizable monomers and an initiating species and another embodiment which causes monomers to exhibit solid-state reactivity (converting from solid monomer to solid polymer without change of physical state). This second embodiment produces a material that is uniform, small, stable for long periods of time (1-10 years), and can either be molecularly imprinted or not. Either before or during expansion for either embodiment, a template can be applied to produce a polymer that is selectively imprinted for a particular molecule. Since the structure is uniform, the risk of producing a device that may have irregularly shaped portions, which could limit attachment of molecules, is significantly decreased.

Technology Status

Apparatus has been prototyped and tested
Issued patent (Patent Number: US 7442754 B2)
This technology is available for licensing to industry for further development and commercialization.