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NASA TECH BRIEF

Heparin Insolubilized with Crosslinking Agent

Certain new plastic compositions have been formed that show appreciable promise in the field of human body implant technology. These involve the synthesis of a polymeric system containing heparin insolubilized with crosslinking agents. Copolymerization is effected by means of cobalt, gamma, photochemical, and other similar irradiation.

It has been disclosed that a new family of water soluble dicationic crosslinking agents having utility in the preparation of polymers of various types exists. Supplementary to this disclosure, the dicationic crosslinking agents are found to form polymers with acrylic acid, acrylamide, methacrylamide, hydroxy ethylmethacrylate, barium acrylate, dimethylamino ethyl methacrylate, etc.

In another aspect, it is determined that water soluble sulfonate polymers such as sodium vinyl sulfonate are insolubilized by crosslinking with dicationic crosslinking agents by reaction either in solution or in bulk. In an extension of work on sodium vinyl sulfonate, commercially available heparin (a polymer with sulfated groups) is also insolubilized by the reaction with the above dicationic crosslinking agents in water, using various concentrations of each component, and polymerizing by means of standard redox systems. The water-insoluble product serves as a filler in known polymers, providing final polymeric composites with anti-coagulant properties. In water solution, heparin is a polysaccharide with sulfate and carboxylic groups forming an acidic polyanion. It is believed that R-OSO_3Na and R-NH-SO_3Na groups of heparin are the reactive centers linking with functional groups of the cationic crosslinking agents. In addition, it is found that mixtures of hydroxyethylmethacrylate and heparin are rendered water-insoluble by crosslinking with the dicationic agents. Cellulosic materials, including paper and wood can be impregnated with solutions and further polymerized to provide materials having polyelectrolyte characteristics. The crosslinking may be effected on the surfaces of films, filaments, or particles of any such polymeric material. Bonding and grafting on polymer surfaces may alternatively be achieved by cobalt gamma irradiation, photochemical irradiation, and the like, to previously achieved heparinized surfaces rather than by crosslinking with persulfate–bisulfite redox systems. Combinations of such methods may also be used.

Notes:

1. In preliminary screening tests, a number of the heparinized polymeric materials prepared have shown blood anti-coagulant properties. This suggests utility as heparinized membranes and as treated plastics for body implant purposes.
2. Documentation is available from:
   Clearinghouse for Federal Scientific and Technical Information
   Springfield, Virginia 22151
   Price $3.00
   Reference: TSP69-10299

Patent status:

No patent action is contemplated by NASA.

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Category 03