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NASA TECH BRIEF

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New Urea-Absorbing Polymers for Artificial Kidney Machines

The problem:

One of the goals in the development of a small inexpensive artificial kidney is an efficient way of removing urea from the dialyzing fluid. Activated charcoal can adsorb from 0.2 to 0.8 gram of urea per 100 grams of carbon. Enzyme decomposition of urea followed by treatment with sodium zirconium phosphate to remove the evolved ammonia extracts about 2 grams of urea per 100 grams of phosphate. There is a need for better absorbents if dialysis devices are to be made small enough to be portable.

The solution:

A new urea-absorbing polymer has been synthesized from polysaccharides which are either etherified or cross linked.

How it's done:

The etherified polymer is made from a modified cellulose derivative which is then reacted with periodate. It will absorb 2 grams of urea per 100 grams of polymer. The cross-linked polymer is prepared from a modified oxidized starch which is cross linked with isocyanates to form urethane copolymers or is cross linked with carboxylic acids to form ester copolymers. Other cross-linking compounds may also be used. After post treatment and purification, 100 grams of the polymers can absorb 6.5 grams of urea at room temperature and pH 2.

The absorption occurs because aldehyde groups, in the cagelike structure formed by the polymer cross-links, have an affinity for urea molecules. Indications are that the polymers could be packed in a column to help remove uremic wastes in artificial kidneys, or they could be administered orally as therapy for uremia. [Also see NASA Tech Brief B75-10327 (NPO-13487)].

Note:

Requests for further information may be directed to:

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Reference: TSP75-10336

Patent status:

This invention is owned by NASA, and a patent application has been filed. Inquiries concerning nonexclusive or exclusive license for its commercial development should be addressed to:

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Categories: 04 (Materials)
05 (Life Sciences)