# SIMULTANEOUS POLYMERIZATION OF TWO VINYL MONOMER MIXTURES TO OPPOSITE FACES OF A FLAT POROUS SUBTRATE

## BACKGROUND OF THE INVENTION

### Field of the Invention

**[0001]** The invention relates to bi-polar electrodes, and more particularly, to a method of simultaneously applying two dissimilar ion exchange polymers to opposite faces of the electrode substrate.

### Description of Related Art

**[0002]** It is increasingly desirable to purify water using passive deionization. Passive deionization uses bi-polar electrodes, e.g., two sheets having a first side or face formed of material with cation-exchange functionality, and a second side or face with anion-exchange functionality. Each of the two different layers of ion exchange material is porous or otherwise somewhat permeable to a neutral fluid by virtue of its chemistry, physical structure and degree of cross-linking, and each layer possesses ion exchange functionality that operates to transport one type of ion across the material in an electric field, while substantially or effectively blocking most ions of the opposite polarity. With the two materials of different exchange type positioned face-to-face in adjacent layers, ions are effectively "blocked" by one or the other layer and thus cannot traverse the sheet.

**[0003]** Applying the ion exchange monomers to the separate sides of the electrode and polymerizing them creates a bi-polar electrode that is more efficient to operate than a series of monoplanar electrodes with ion exchange membranes pressed against them. In this regard, there is a desire to provide new processes for bi-polar electrode fabrication.

## SUMMARY OF THE INVENTION

**[0004]** In one aspect, the invention is directed to a method of forming a bi-polar electrode having ion exchange polymers on opposite faces of a porous substrate. The method includes providing an electrode substrate with activated carbon layers on

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