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(54) **CROSSLINKED GELS COMPRISING
 POLYALKYLENEIMINES, AND THEIR USES
 AS MEDICAL DEVICES**

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(*) Notice: Subject to any disclaimer, the term of this
 patent is extended or adjusted under 35
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This patent is subject to a terminal dis-
 claimer.

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(57) **ABSTRACT**

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(58) **Field of Classification Search**

None
 See application file for complete search history.

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One aspect of the present invention generally relates to meth-
 ods of sealing a wound or tissue plane or filling a void space.
 In a preferred embodiment, the wound is an ophthalmic,
 pleural or dural wound. In certain instances, the compositions
 used to seal the wound or tissue plane comprises a polyalkyl-
 eneimine. In a preferred embodiment, the polyalkyleneimine
 is polyethyleneimine. Treatment of the polyethyleneimine
 with a cross-linking reagent causes the polyethyleneimine
 polymers to polymerize forming a seal. In certain instances,
 the cross-linking reagent is a polyethylene glycol having
 reactive terminal groups. In certain instances, the reactive
 terminal groups are activated esters, such as N-hydroxy suc-
 cinimide ester. In certain instances, the reactive terminal
 groups are isocyanates. In certain instances, the polyethyl-
 eneimine has a lysine, cysteine, isocysteine or other nucleo-
 philic group attached to the periphery of the polymer. In
 certain instances, the polyethyleneimine is mixed with a sec-
 ond polymer, such as a polyethylene glycol containing
 nucleophilic groups. In certain instances, the compositions
 used to seal the wound or tissue plane are formed by reacting
 a polyalkyleneimine bearing electrophilic groups with a
 cross-linking reagent containing nucleophilic groups. In cer-
 tain instances, the electrophilic groups on the polyalkylene-
 imine are activated esters, such as N-hydroxy succinimide
 ester. In certain instances, the compositions used to seal the
 wound or tissue plane are formed by reacting a polyalkyle-
 neimine bearing photopolymerizable groups with ultraviolet
 or visible light. Compositions used to seal the wound which
 contain PEI or a derivative of PEI are found to adhere tightly
 to the tissue. Other aspects of the present invention relate to
 methods of filling a void of a patient or adhering tissue. In
 certain instances, the methods use a polyalkyleneimine. In a
 preferred embodiment, the polyalkyleneimine is polyethyl-
 eneimine. Another aspect of the present invention relates to a
 polymeric composition formed by exposing a polyalkylene-
 imine to an activated polyalkylene glycol. In certain
 instances, the composition is attached to mammalian tissue.

10 Claims, 39 Drawing Sheets