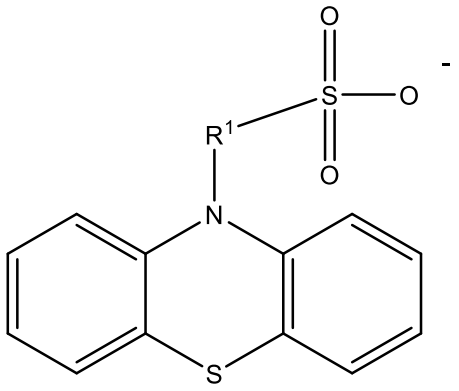
formulation errors. Mass transport imbalances can, in some instances, result in reduced durability of the electrochromic device, in particular if the slower mass transported active component is subject to over-oxidization or over-reduction at a particular electrode.

[0005] Factors that contribute to reduced mass transport of a component, and correspondingly mass transport imbalance as between the components, include, but are not limited to, reduced solubility of that component in the electrochromic layer and/or lack of a charge associated therewith. With some electrochromic devices, the cathodic component has a positive charge and has associated therewith counter-anions, while the anodic component has no charge associated therewith. The lack of charge associated with the anodic component can contribute to an undesirable mass transport imbalance relative to the cathodic component.

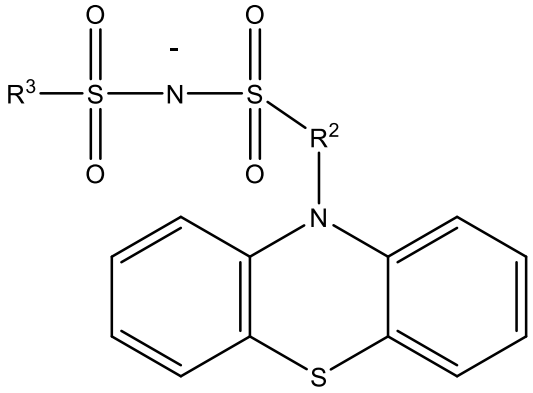
[0006] It would be desirable to develop new electrochromic devices and compositions in which the active components thereof, and in particular, the cathodic and anodic components, provide improved mass transport balance. It would be further desirable that such newly developed electrochromic devices and compositions provide, or otherwise have associated therewith, improved durability, reduced costs of manufacture and/or operation, and/or improved efficiency of operation.

SUMMARY

[0007] In accordance with the present disclosure, there is provided an electrochromic device comprising: (a) a first substrate having a surface comprising a first transparent electrode layer; (b) a second substrate having a surface comprising a second transparent conductive electrode layer, wherein said first transparent electrode layer and said second transparent electrode layer are in opposing spaced opposition relative to each other; and (c) an electrochromic layer interposed between said first transparent electrically conductive electrode layer and said second transparent electrically conductive electrode layer. The electrochromic layer comprises: (i) a cathodic component; and (ii) an anodic component comprising an anodic component anion selected from at least one anodic component anion represented by the following Formula (I) or Formula (II),



(I)



(II)

With reference to Formula (I), R^1 is selected from divalent linear or branched alkane linking group. With reference to Formula (II), R^2 is selected from divalent linear or branched alkane linking group, and R^3 is selected from fluorine, linear or branched fluorinated alkyl, or linear or branched perfluorinated alkyl. The electrochromic layer further comprises: (iii) an optional electrolyte; and (iv) a polymer matrix.

[0007a] In one aspect, the present disclosure provides an electrochromic device comprising:

(a) a first substrate having a surface comprising a first transparent electrode layer;

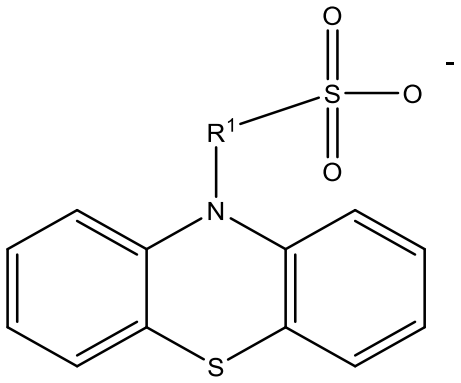
(b) a second substrate having a surface comprising a second transparent conductive electrode layer,

wherein said first transparent electrode layer and said second transparent electrode layer are in opposing spaced opposition; and

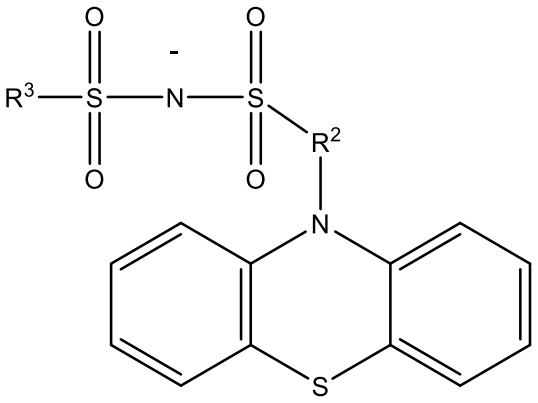
(c) an electrochromic layer interposed between said first transparent electrically conductive electrode layer and said second transparent electrically conductive electrode layer, wherein said electrochromic layer comprises,

(i) a cathodic component,

(ii) an anodic component comprising an anodic component anion selected from at least one anodic component anion represented by the following Formula (I) or Formula (II),



(I)



(II)

wherein for Formula (I), R^1 is selected from divalent linear or branched alkane linking group, and

wherein for Formula (II), R^2 is selected from divalent linear or branched alkane linking group, and R^3 is selected from fluorine, linear or branched fluorinated alkyl, or linear or branched perfluorinated alkyl,

(iii) an optional electrolyte, and

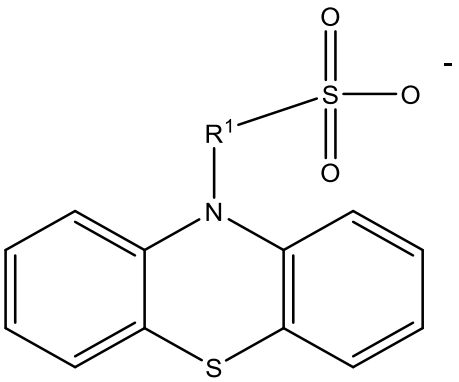
(iv) a polymer matrix.

[0008] In accordance with the present disclosure, there is further provided an electrochromic composition comprising: (i) a cathodic component; (ii) an anodic component comprising an anodic component anion selected from at least one anodic component anion represented by Formula (I) or Formula (II), as described above; (iii) an optional electrolyte; (iv) a polymeric thickener; and (v) a solvent.

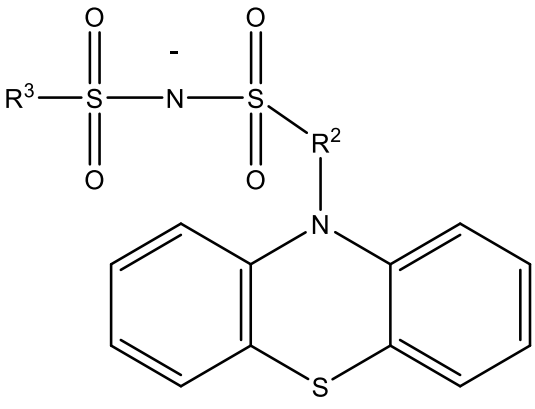
[0008a] In another aspect, the present disclosure provides an electrochromic composition comprising,

(i) a cathodic component,

(ii) an anodic component comprising an anodic component anion selected from at least one anodic component anion represented by the following Formula (I) or Formula (II),



(I)



(II)

wherein for Formula (I), R^1 is selected from divalent linear or branched alkane linking group, and

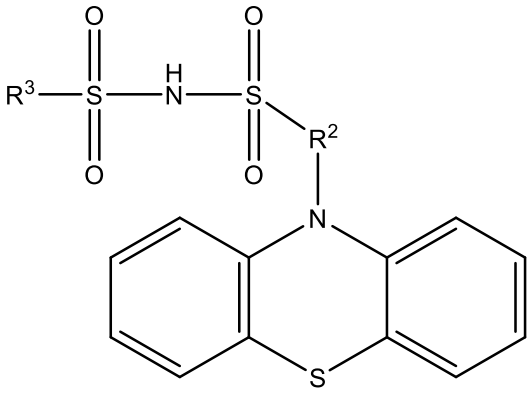
wherein for Formula (II), R^2 is selected from divalent linear or branched alkane linking group, and R^3 is selected from fluorine, linear or branched fluorinated alkyl, or linear or branched perfluorinated alkyl,

(iii) an optional electrolyte,

(iv) a polymeric thickener; and

(v) a solvent.

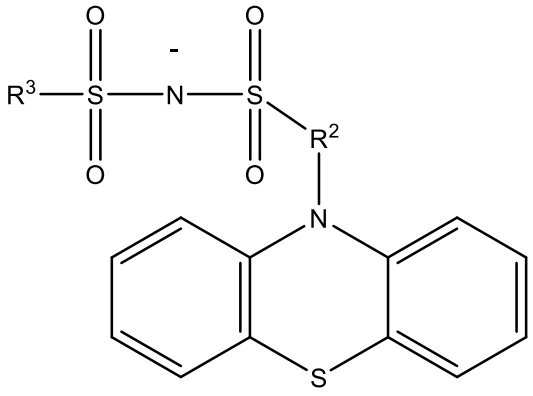
[0009] In further accordance with another aspect of the present disclosure, there is provided a compound represented by the following Formula (IIa),



(IIa)

With reference to Formula (IIa), R^2 is selected from divalent linear or branched alkane linking group; and R^3 is selected from fluorine, linear or branched fluorinated alkyl, or linear or branched perfluorinated alkyl.

[0010] In accordance with another aspect of the present disclosure, there is additionally provided a salt comprising an anion represented by the following Formula (II),



(II)

With reference to Formula (II), R^2 is selected from divalent linear or branched alkane linking group; and R^3 is selected from fluorine, linear or branched fluorinated alkyl, or linear or branched perfluorinated alkyl.

[0011] The features that characterize the present disclosure are pointed out with particularity in the claims, which are annexed to and form a part of this disclosure. These and other features of the disclosure, its operating advantages and the specific objects obtained by its use will be more fully understood from the following detailed description in which non-limiting examples of the disclosure are illustrated and described.