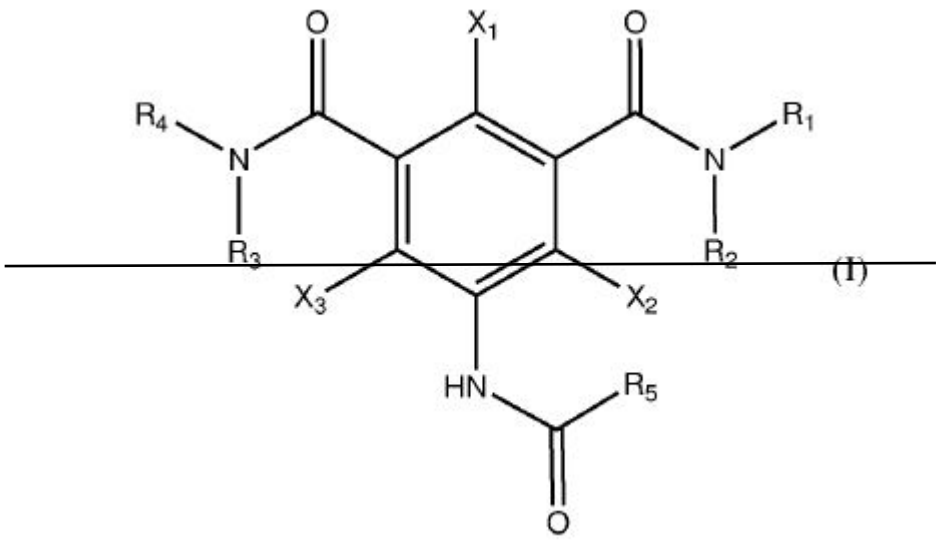
SUMMARY

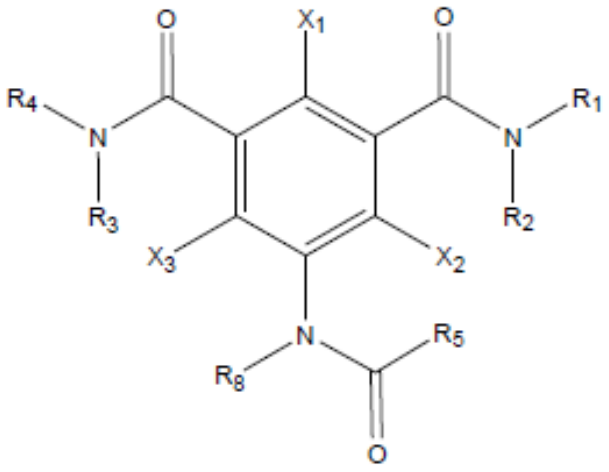
[0006] The present disclosure is based, at least in part, unexpected discovery that an aqueous solution of certain agent(s) is capable of making a biological material (e.g., a tissue or an organ of an insect or a mammal, or a bio-engineering material (e.g., a collagen scaffold) transparent; hence allowing the biological material previously labeled with a marker (e.g., a dye or a fluorescent protein) to be traced after the tissue becomes transparent.

[0007] Accordingly, one aspect of the present disclosure is to provide a novel aqueous solution for rendering a biomaterial transparent. The aqueous solution is characterized in having,

a first active compound of formula (I)



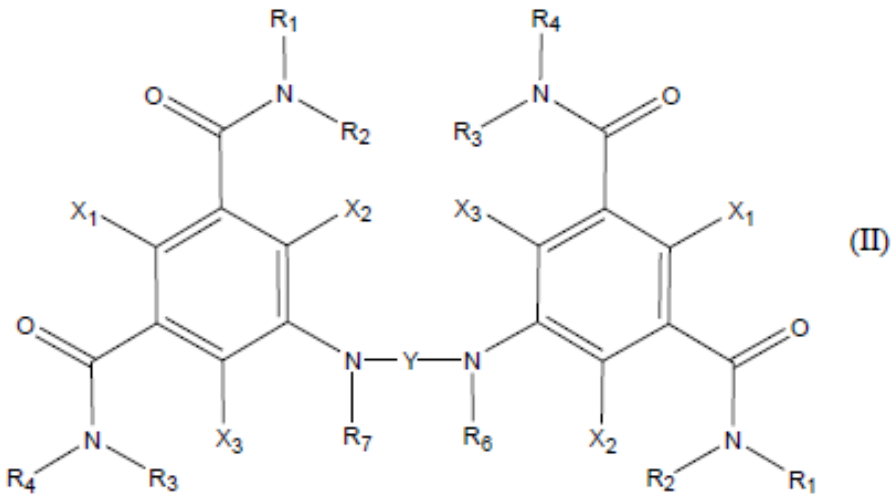
(I)



(I)

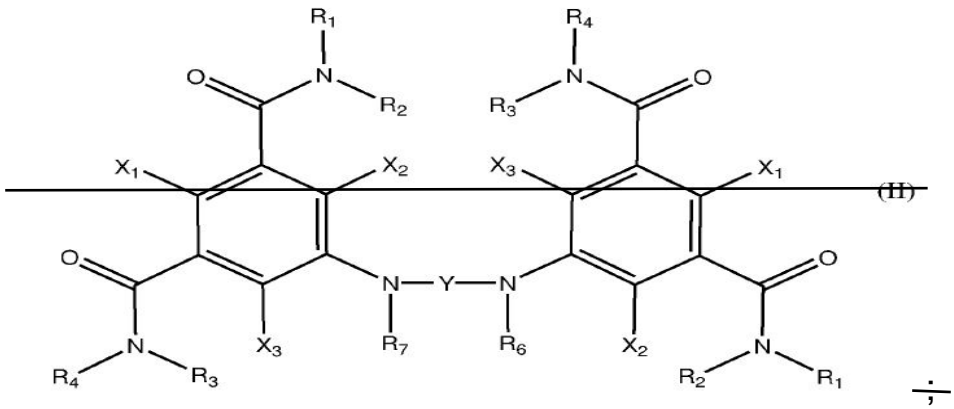
; or

a second active compound of formula (II)



(II)

;



or a combination thereof;

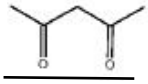
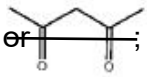
a sufficient amount of a solvent for dissolving the first or second active compound therein and thereby forming the aqueous solution; wherein:

R_1, R_2, R_3, $\underline{R_4}$ and ~~R_4~~ $\underline{R_8}$ are independently H, or C_{1-6} alkyl substituted with at least two -OH;

R_5 is $\underline{-CH_2OCH_3}$ $\underline{\text{or}}$ C_{1-3} alkyl $\underline{\text{optionally}}$ substituted with at least one -OH or ~~$-CH_2OCH_3$~~;

R_6 and R_7 are independently acetyl or C_{1-3} alkyl;

X_1, X_2, and X_3 are independently a halogen selected from the group consisting of Cl, Br, and I;

Y is  $\underline{\text{or}}$ C_{1-3} alkyl substituted with at least one -OH ~~or~~ ;

the pH of the aqueous solution is less than 11; and

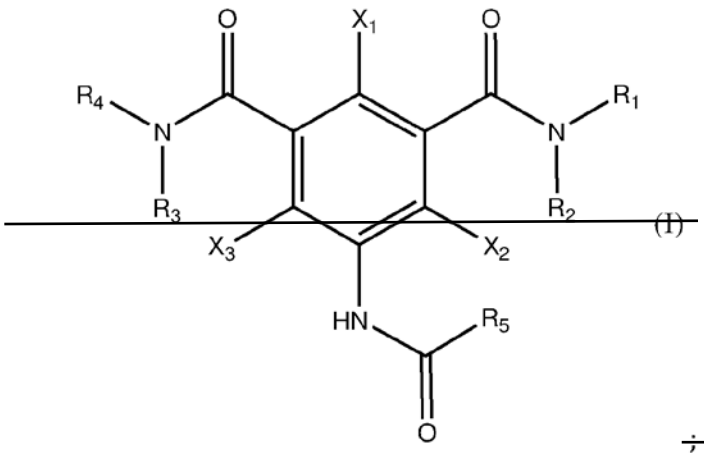
the osmolarity of the aqueous solution is from 200 to 3,500 mOSm/L.

[0008] Preferably, the pH of the aqueous solution is between 6 to 9, and the osmolarity of the aqueous solution is from 250 to 1,000 mOSm/L.

collagen scaffolds) transparent; hence allowing the biological material previously labeled with a marker (e.g., a dye or a fluorescent protein) to be traced after the tissue becomes transparent.

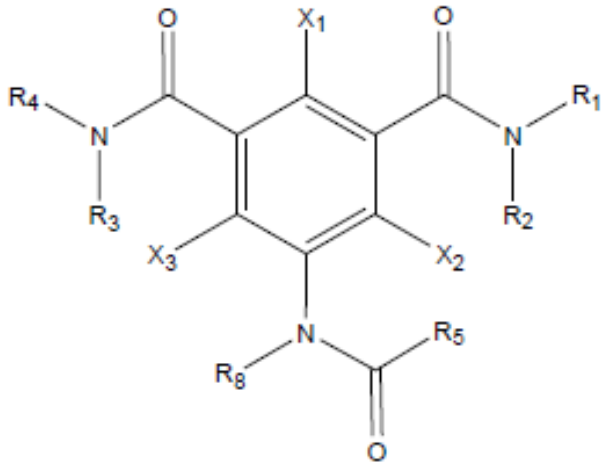
[0027] Accordingly, one aspect of the present disclosure is to provide a novel aqueous solution for rendering a biomaterial transparent. The aqueous solution is characterized in having,

a first active compound of formula (I)



(I)

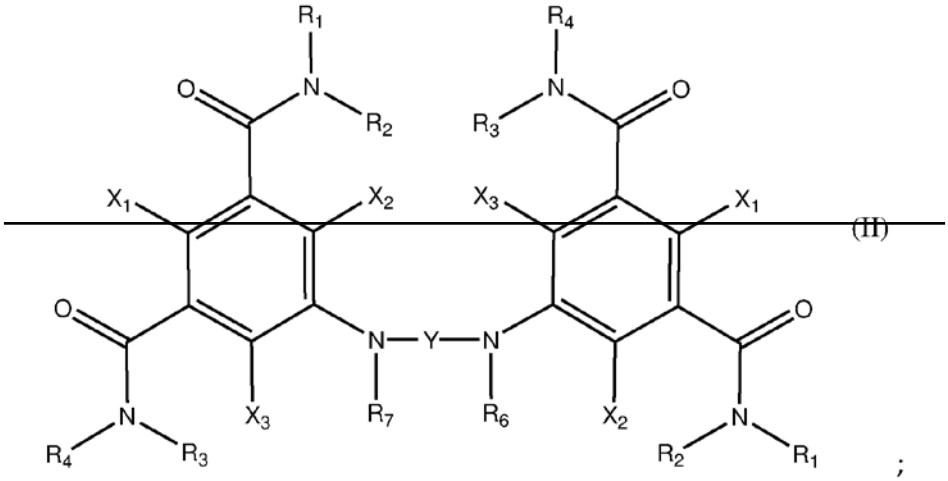
; or



(I)

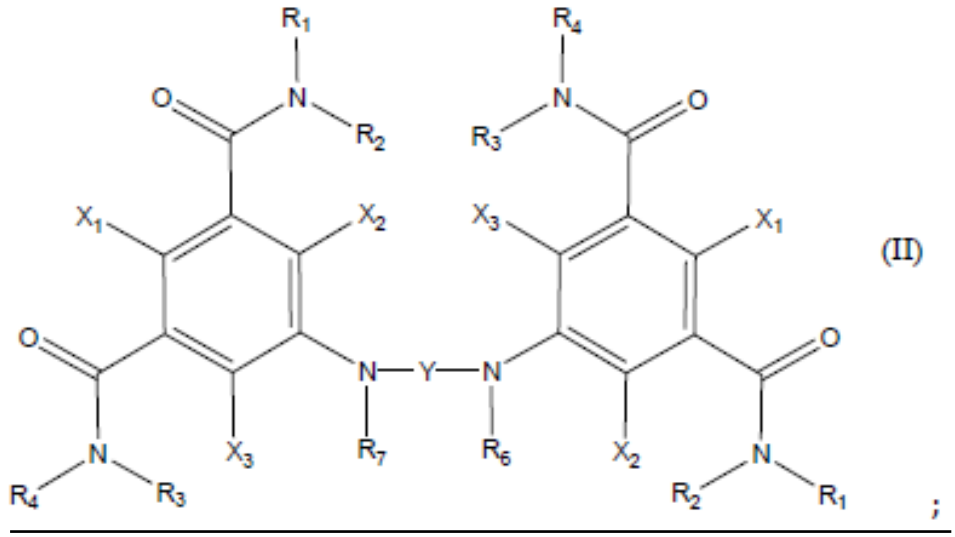
; or

a second active compound of formula (II)


R1
O
N
R2
X1
X2
R4
N
O
R3
X3
X1
O
O
N
Y
N
N
R4
R3
X3
R7
R6
X2
N
R2
R1

(II)

;


R1
O
N
R2
X1
X2
R4
N
O
R3
X3
X1
O
O
N
Y
N
N
R4
R3
X3
R7
R6
X2
N
R2
R1

(II)

;

or a combination thereof;

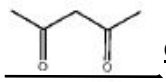
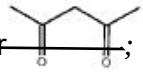
a sufficient amount of a solvent for dissolving the first or second active compound therein and thereby forming the aqueous solution;

wherein:

R_1, R_2, R_3, R_4 and ~~R_4~~R_8 are independently H, or C_{1-6} alkyl substituted with at least two -OH;

R_5 is $-CH_2OCH_3$ or C_{1-3} alkyl optionally substituted with at least one -OH ~~or $-CH_2OCH_3$~~; R_6 and R_7 are independently acetyl or C_{1-3} alkyl;

X_1, X_2, and X_3 are independently a halogen selected from the group consisting of Cl, Br, and I;

Y is  or C_{1-3} alkyl substituted with at least one -OH ~~or~~ ;

the pH of the aqueous solution is less than 11; and

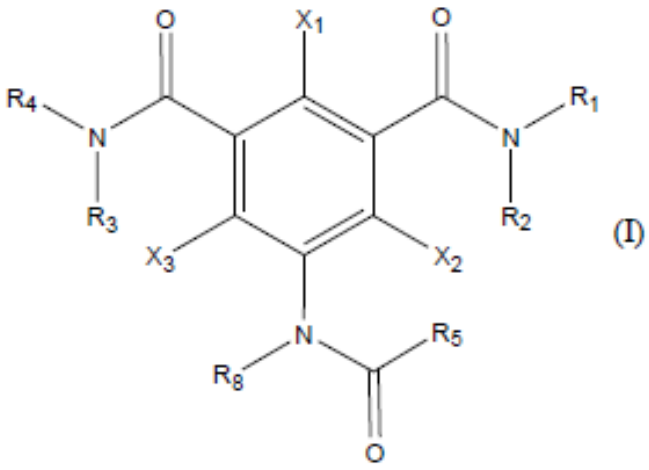
the osmolarity of the aqueous solution is from 200 to 3,500 mOSm/L.

[0028] Unless otherwise indicated, the term "alkyl" means a straight chain or a branched hydrocarbon having from 1 to 20 *(e.g.,* 1 to 10, 1 to 9, 1 to 8, 1 to 7, 1 to 6, 1 to 5, 1 to 4, 1 to 3, 1 to 2, or 1) carbon atoms. Alkyl moieties having from 1 to 4 carbons are referred to as "lower alkyl." Examples of alkyl groups include methyl, ethyl, propyl, isopropyl, n-butyl, t-butyl, isobutyl, 2-isopropyl-3-methyl butyl, pentyl, pentan-2-yl, hexyl, isohexyl, heptyl, heptan-2-yl, 4,4-dimethylpentyl, octyl, 2,2,4-trimethylpentyl, nonyl, decyl, undecyl and dodecyl. Unless otherwise specified, each instance of an alkyl group is independently optionally substituted, *i.e.,* unsubstituted (an "unsubstituted alkyl") or substituted (a "substituted alkyl") with one or more substituents. The term "substituted," when used to describe a chemical structure or moiety, refers to a derivative of that

WHAT IS CLAIMED IS:

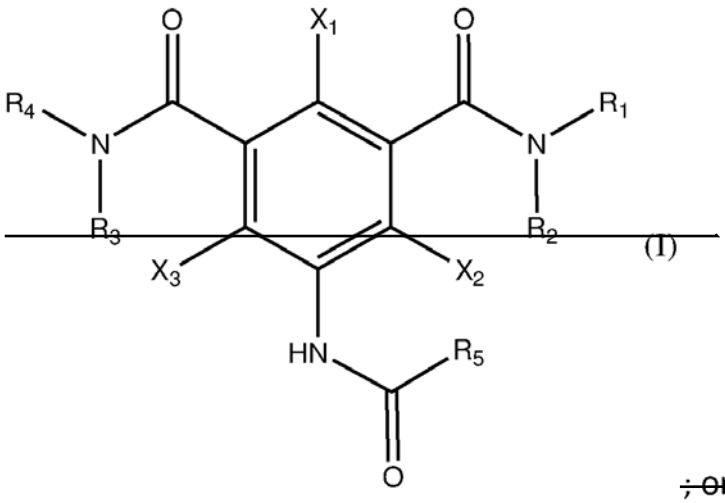
1. An aqueous solution for rendering a biomaterial transparent, comprising:

a first active compound of formula (I)



(I)

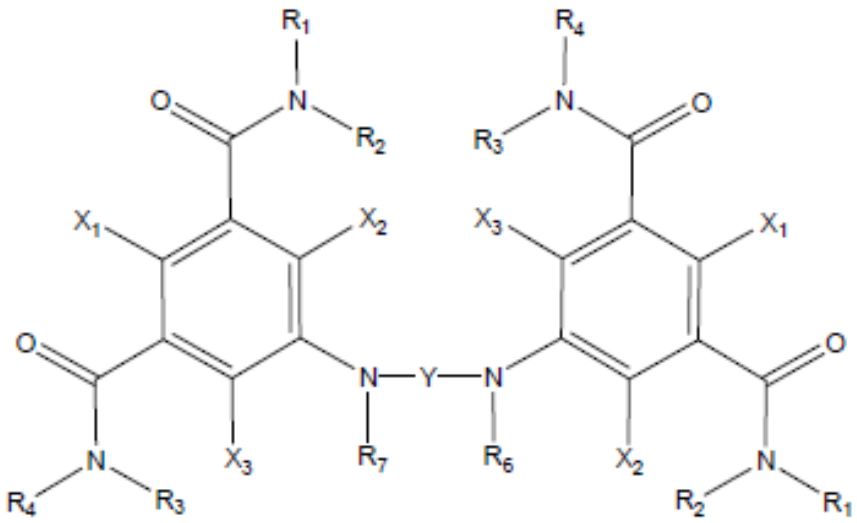
; or



(I)

~~; or~~

a second active compound of formula (II)



(II)

;

or a combination thereof;

a sufficient amount of a solvent that is water or a salt balanced buffer solution for dissolving the first or second, or a combination of the active compounds therein and thereby forming the aqueous solution;

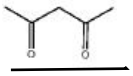
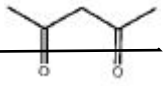
wherein:

R_1, R_2, R_3, ~~and~~ R_4 and R_8 are independently H, or C_{1-6} alkyl substituted with at least two -OH;

R_5 is $-CH_2OCH_3$ or C_{1-3} alkyl optionally substituted with at least one -OH ~~or $-CH_2OCH_3$~~;

R_6 and R_7 are independently acetyl or C_{1-3} alkyl;

X_1, X_2, and X_3 are independently a halogen selected from the group consisting of Cl, Br, and I;

Y is  or C_{1-3} alkyl substituted with at least one -OH ~~or~~ ;

the pH of the aqueous solution is less than 11; and

the osmolarity of the aqueous solution is from 200 to 3,500 mOSm/L.

2. The aqueous solution of claim 1, wherein the pH of the aqueous solution is between 6 to 9, and the osmolarity of the aqueous solution is from 250 to 1,000 mOSm/L.

3. The aqueous solution of claim 2, wherein the first active compound of formula (I) is any of the followings,