employing both thermal goggles and night vision goggles. This can be achieved by employing a multiple-part system that can emit light and heat upon activation, at least a first part comprising at least one oxalate ester, at least one fluorescer, and at least one inorganic salt, and at least a second part comprising at least one peroxide and at least one catalyst chosen from sodium salicylate, lithium salicylate, 5-chlorolithium salicylate , triazoles (e.g., 1,2,3-triazole and 1,2,4-triazole), substituted triazoles (e.g., substituted 1,2,3-triazole and substituted 1,2,4-triazole), imidazoles, and substituted imidazoles.

[006] Chemical light systems employing an oxalate ester, a peroxide, a fluorescer, and a catalyst are generally known to those skilled in the art. Also known to those skilled in the art is the temperature sensitivity of such a system. A disadvantage of typical oxalate ester chemical light systems is that they generate no detectable light at temperatures below the freezing point of water. There is therefore a need for an oxalate ester chemical light system that is less affected by low ambient temperatures.

[007] It is accordingly an object of certain embodiments of the disclosure to provide a combined chemiluminescent and exothermic reaction that generates usable light at temperatures that occur in the normal environment. Certain embodiments of the present disclosure provide a reaction system that is self heating.

[008] Generally, the present disclosure provides markers and signals comprising a multiple-part system, which upon activation emits light and heat, and methods of using such markers and signals. More specifically, it has been discovered that the use of certain inorganic salts in an oxalate ester/peroxide based chemiluminescent system generates heat in addition to light, sufficient to act as a visual and thermal marker.

[008a] In one aspect, there is provided a multiple-part marking system that comprises at least one first part comprising at least one oxalate ester, at least one fluorescer, and at least one inorganic salt; and at least one second part comprising at least one peroxide and at least one catalyst chosen from sodium salicylate, lithium salicylate, 5-chlorolithium salicylate, triazoles, substituted triazoles, imidazoles, and substituted imidazoles; wherein light and heat are emitted when the two parts interact; wherein the at least one inorganic salt is chosen from sodium thiosulphate, potassium thiosulphate, cobalt acetate, copper acetate, lead acetate, cupric chloride, ferric chloride, calcium iodide, potassium iodide, and silver nitrate, and wherein the at least one inorganic salt is present in an amount ranging from 0.1 percent to 30 percent by weight based on the total weight of the two-part composition.

[009] Also disclosed~~One aspect of the disclosure~~ is a multiple-part marking system that comprises at least one part comprising at least one oxalate ester, at least one fluorescer, and at least one inorganic salt, and at least a second part comprising at least one peroxide and at least one catalyst chosen from sodium salicylate, lithium salicylate, 5-chlorolithium salicylate , triazoles (e.g., 1,2,3-triazole and 1,2,4-triazole), substituted triazoles (e.g., substituted 1,2,3-triazole and substituted 1,2,4-triazole), imidazoles, and substituted imidazoles, wherein light and heat are emitted when the two parts interact, and wherein the at least one inorganic salt is chosen from sodium thiosulphate, potassium thiosulphate, cobalt acetate, copper acetate, lead acetate,

cupric chloride, ferric chloride, calcium iodide, potassium iodide, and silver nitrate. In another exampleaspect of the disclosure, light and heat are emitted instantly when the two parts intermix. In another exampleaspect of the disclosure, the system reaches a peak emission of light and heat when the two parts of the system are completely mixed. Another exampleaspect of the disclosure is directed to emitting light at multiple wavelengths, including multiple wavelengths in the infrared spectrum, the ultra-violet spectrum, the visible spectrum, or a combination thereof.

[010] In another exampleaspect of the disclosure, the multiple-part marking system comprises carrier solvents for the first part and the second part. Another exampleaspect of the disclosure comprises additional components of the marking system. Such additional components can include thickeners to allow the marker to stick to the target better, fluorescent powders for day time target marking, and antifreeze agents to prevent freezing.

[011] In another exampleaspect of the disclosure, one part of the multiple-part system is contained inside a housing which keeps the at least first part of the marking system separate from the at least second part of the marking system, until such time as mixing is desired. Another exampleaspect of the disclosure includes the multiple-part marking system being housed within hollow flexible plastic tubing, wherein the at least one part of the marking system is contained within the hollow flexible tubing, and wherein the at least second part is contained inside a sealed glass vial which is located within the flexible tubing containing the first part, wherein upon breaking of the glass vial, the two parts would intermix.

[011a] In one aspect, there is provided a chemiluminescent and thermal marker comprising hollow flexible tubing comprising:

a) at least one first part comprising at least one oxalate ester, at least one fluorescer, and at least one inorganic salt, wherein the at least one inorganic salt is chosen from sodium thiosulphate, potassium thiosulphate, cobalt acetate, copper acetate, lead acetate, cupric chloride, ferric chloride, calcium iodide, potassium iodide, and silver nitrate, and wherein the at least one inorganic salt is present in an amount ranging from 0.1 percent to 30 percent by weight based on the total weight of the two part composition;

b) at least one sealed glass vial comprising therein at least one second part comprising at least one peroxide and at least one catalyst chosen from sodium salicylate, lithium salicylate, 5 chlorolithium salicylate, triazoles, substituted triazoles, imidazoles, and substituted imidazoles; wherein the at least one sealed glass vial is comprised within the at least one first part, and wherein breaking the at least one sealed glass vial will cause the at least one first part and the at least one second part to mix and react together.

[011b] In another aspect, there is provided a projectile comprised of a multiple-part chemiluminescent and thermal marker within the projectile, wherein the multiple-part chemiluminescent and thermal marker comprises at least one first part comprising at least one oxalate ester, at least one fluorescer, and at least one inorganic salt, wherein the at least one inorganic salt is chosen from sodium thiosulphate, potassium thiosulphate, cobalt acetate, copper acetate, lead acetate, cupric chloride, ferric chloride, calcium iodide, potassium iodide, and silver nitrate, and wherein the at least one inorganic salt is present in an amount ranging from 0.1 percent to 30 percent by weight based on the total of the two-part composition; at least one breakable barrier separating the at least one first part from at least one second part comprising at least one peroxide and at least one catalyst chosen from sodium salicylate, lithium salicylate, 5-chlorolithium salicylate, triazoles, substituted triazoles, imidazoles, and substituted imidazoles; wherein light and heat are emitted when the at least one breakable barrier is broken.

[012] Another exampleaspect of the disclosure is directed to a projectile comprised of a multiple-part chemiluminescent and thermal marker within the projectile, wherein the multiple-part chemiluminescent and thermal marker comprises at least one first part comprising at least one oxalate ester, at least one fluorescer, and at least one inorganic salt, wherein the at least one inorganic salt is chosen from sodium thiosulphate, potassium thiosulphate, cobalt acetate, copper acetate, lead acetate, cupric chloride, ferric chloride, calcium iodide, potassium iodide, and silver nitrate; at least one breakable barrier separating the at least one first part from at least one second part comprising at least one peroxide and at least one catalyst chosen from sodium salicylate, lithium salicylate, 5-chlorolithium salicylate , triazoles (e.g., 1,2,3-triazole and 1,2,4-triazole), substituted triazoles (e.g., substituted 1,2,3-triazole and

substituted 1,2,4-triazole), imidazoles, and substituted imidazoles; wherein light and heat are emitted when the at least one breakable barrier is broken.

[012a] In yet another aspect, there is provided a method of marking a target comprising:

a) launching a projectile containing a multiple-part chemiluminescent and thermal marking system as defined above;

b) breaking the at least one breakable barrier between the at least one first part and the at least one second part;

c) generating light and heat as products of the reaction between the at least first part and the at least second part; and

d) marking a target hit by the projectile with the activated multiple-part chemiluminescent and thermal marking system.

[013] Yet another ~~aspect~~example of the disclosure is directed to a method of marking a target comprising:

a) launching a projectile containing a multiple-part chemiluminescent and thermal marking system, wherein at least one first part of the multiple-part chemiluminescent and thermal marking system comprises at least one oxalate ester, at least one fluorescer, and at least one inorganic salt, wherein the at least one inorganic salt is chosen from sodium thiosulphate, potassium thiosulphate, cobalt acetate, copper acetate, lead acetate, cupric chloride, ferric chloride, calcium iodide, potassium iodide, and silver nitrate, at least one breakable barrier separating the at least one first part from at least a second part comprising at least one peroxide and at least one catalyst chosen from sodium salicylate, lithium salicylate, 5-chlorolithium salicylate , triazoles (e.g., 1,2,3-triazole and 1,2,4-triazole), substituted triazoles (e.g., substituted 1,2,3-triazole and substituted 1,2,4-triazole), imidazoles, and substituted imidazoles;

b) breaking the at least one breakable barrier between the at least one first part and the at least one second part;

c) generating light and heat as products of the reaction between the at least first part and the at least second part; and

d) marking a target hit by the projectile with the activated multiple-part chemiluminescent and thermal marking system.

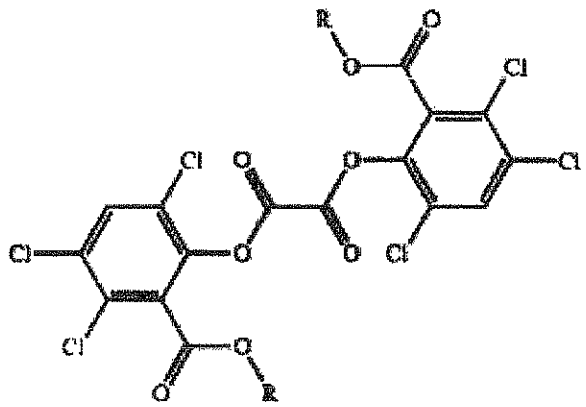
[014] A further ~~aspect~~example of the disclosure is directed to method of signaling comprising activating a multiple-part chemiluminescent and thermal marking system by mixing at least one first part comprising at least one oxalate ester, at least one fluorescer, and at least one inorganic salt with at least one second part comprised of at least one peroxide and at least one catalyst chosen from *sodium salicylate*, *lithium salicylate*, *5-chlorolithium salicylate*, *triazoles* (e.g., 1,2,3-triazole and 1,2,4-triazole), substituted triazoles (e.g., substituted 1,2,3-triazole and substituted 1,2,4-triazole), imidazoles, and substituted imidazoles and generating light and heat; wherein the at least one inorganic salt is chosen from sodium thiosulphate, potassium thiosulphate, cobalt acetate, copper acetate, lead acetate, cupric chloride, ferric chloride, calcium iodide, potassium iodide, and silver nitrate. In certain of these examples~~embodiments~~, the multiple-part chemiluminescent and thermal marking system is present in hollow

WHAT IS CLAIMED IS:

1. A multiple-part marking system that comprises at least one first part comprising at least one oxalate ester, at least one fluorescer, and at least one inorganic salt; and at least one second part comprising at least one peroxide and at least one catalyst chosen from sodium salicylate, lithium salicylate, 5-chlorolithium salicylate , triazoles, substituted triazoles, imidazoles, and substituted imidazoles; wherein light and heat are emitted when the two parts interact; and wherein the at least one inorganic salt is chosen from sodium thiosulphate, potassium thiosulphate, cobalt acetate, copper acetate, lead acetate, cupric chloride, ferric chloride, calcium iodide, potassium iodide, and silver nitrate.

2. The multiple-part marking system according to claim 1, wherein the at least one oxalate ester is chosen from bis(2,4,5-trichloro-6-carbopentoxyphenyl)oxalate; bis(2,4,5-trichlorophenyl)oxalate; bis(2,4,5-tribromo-6-carbohexoxyphenyl)oxalate; bis(2,4,5-trichloro-6-carboisopentoxyphenyl) oxalate; bis(2,4,5-trichloro-6-carbobenzoxyphenyl) oxalate; bis(2-nitrophenyl)oxalate; bis(2,4-dinitrophenyl)oxalate; bis(2,6-dichloro-4-nitrophenyl) oxalate; bis(2,4,6-trichlorophenyl)oxalate; bis(3-trifluoromethyl-4-nitrophenyl)oxalate; bis(2-methyl-4,6-dinitrophenyl)oxalate; bis(1,2-dimethyl-4,6-dinitrophenyl)oxalate; bis(2,4-dichlorophenyl)oxalate; bis(2,4-dinitrophenyl)oxalate; bis(2,5-dinitrophenyl)oxalate; bis(2-formyl-4-nitrophenyl)oxalate; bis(pentachlorophenyl)oxalate; bis(1,2-dihydro-2-oxo-1-pyridyl)glyoxal; bis(2,4-dinitro-6-methylphenyl)oxalate; bis-N-phthalimidyl oxalate.

3. The multiple-part marking system according to claim 1, wherein the at least one oxalate ester is chosen from oxalates represented by the general formula (I)



(I)

wherein R = CH_2A and A is chosen from alkyl chains, alkyl rings, and aromatic rings or combinations thereof, and

wherein R is linear or nonlinear, and comprises from 4-15 carbon atoms.

4. The multiple-part marking system according to claim 1, wherein the at least one oxalate ester is chosen from:

bis{3,4,6-trichloro-2-[(2-methylpropoxy)carbonyl]phenyl} oxalate;

bis{3,4,6-trichloro-2-[(cyclopropylmethoxy)carbonyl]phenyl} oxalate;

bis{3,4,6-trichloro-2-[(2-methylbutoxy)carbonyl]phenyl} oxalate;

bis{3,4,6-trichloro-2-[(3-methylbutoxy)carbonyl]phenyl} oxalate;

bis{3,4,6-trichloro-2-[(2,2-dimethylpropoxy)carbonyl]phenyl} oxalate;

bis{3,4,6-trichloro-2-[(2-methylpentyloxy)carbonyl]phenyl} oxalate;

bis{3,4,6-trichloro-2-[(3-methylpentyloxy)carbonyl]phenyl} oxalate;

bis{3,4,6-tri chloro-2-[(4-methylpentyloxy)carbonyl]phenyl} oxalate;

bis{3,4,6-trichloro-2-[(3,3-dimethylbutoxy)carbonyl]phenyl} oxalate;

bis{3,4,6-trichloro-2-[(2-ethylbutoxy)carbonyl]phenyl} oxalate;

bis{3,4,6-trichloro-2-[(cyclopentylmethoxy)carbonyl]phenyl} oxalate;

bis{3,4,6-trichloro-2-[(2-methylhexyloxy)carbonyl]phenyl} oxalate;

bis{3,4,6-trichloro-2-[(3-methylhexyloxy)carbonyl]phenyl} oxalate;

bis{3,4,6-trichloro-2-[(4-methylhexyloxy)carbonyl]phenyl} oxalate;

bis{3,4,6-trichloro-2-[(5-methylhexyloxy)carbonyl]phenyl} oxalate;

bis{3,4,6-trichloro-2-[(cyclohexylmethoxy)carbonyl]phenyl} oxalate;

bis{3,4,6-trichloro-2-[(phenylmethoxy)carbonyl]phenyl} oxalate;

bis{3,4,6-trichloro-2-[(2-phenylethoxy)carbonyl]phenyl} oxalate;

bis(3,4,6-trichloro-2-{[(2-methylphenyl)methoxy]carbonyl}phenyl) oxalate;

bis(3,4,6-trichloro-2-{[(3-methylphenyl)methoxy]carbonyl}phenyl) oxalate;

bis(3,4,6-trichloro-2-{[(4-methylphenyl)methoxy]carbonyl}phenyl) oxalate;
bis(3,4,6-trichloro-2-{[(2,3-dimethylphenyl)methoxy]carbonyl}phenyl) oxalate;
bis(3,4,6-trichloro-2-{[(2,4-dimethylphenyl)methoxy]carbonyl}phenyl) oxalate;
bis(3,4,6-trichloro-2-{[3,4-dimethylphenyl)methoxy]carbonyl}phenyl) oxalate;
bis(3,4,6-trichloro-2-{[(3,5-dimethylphenyl)methoxy]carbonyl}phenyl) oxalate;
bis(3,4,6-trichloro-2-{[(2,6-dimethylphenyl)methoxy]carbonyl}phenyl) oxalate;
bis(3,4,6-trichloro-2-{[(2-ethylphenyl)methoxy]carbonyl}phenyl) oxalate;
bis(3,4,6-trichloro-2-{[(3-ethylphenyl)methoxy]carbonyl}phenyl) oxalate;
bis(3,4,6-trichloro-2-{[(4-ethylphenyl)methoxy]carbonyl}phenyl) oxalate;
bis(3,4,6-trichloro-2-{[2-(2-methylphenyl)ethoxy]carbonyl}phenyl) oxalate;
bis(3,4,6-trichloro-2-{[2-(3-methylphenyl)ethoxy]carbonyl}phenyl) oxalate;
bis(3,4,6-trichloro-2-{[2-(4-methylphenyl)ethoxy]carbonyl}phenyl) oxalate;
bis{3,4,6-trichloro-2-[(2-phenylpropoxy)carbonyl]phenyl} oxalate;
bis{3,4,6-trichloro-2-[(3-phenylpropoxy)carbonyl]phenyl} oxalate;
bis{3,4,6-trichloro-2-[1-naphthalenylmethoxy)carbonyl]phenyl} oxalate;
bis{3,4,6-trichloro-2-[2-naphthalenylmethoxy)carbonyl]phenyl} oxalate;
bis{3,4,6-trichloro-2-[(2,2-diphenylethoxy)carbonyl]phenyl} oxalate;
bis{3,4,6-trichloro-2-[(9-fluorenylmethoxy)carbonyl]phenyl} oxalate; and
bis{3,4,6-trichloro-2-[(9-anthracenylmethoxy)carbonyl]phenyl} oxalate

5. The multiple-part marking system according to claim 1, wherein the at least one oxalate ester is present in an amount ranging from 3 percent to 60 percent by weight, based on the total weight of the two-part composition.

6. The multiple-part marking system according to claim 1, wherein the at least one fluorescer is chosen from 1-methoxy-9,10-bis(phenylethynyl) anthracene, perylene, rubrene, 16,17-didecycloxyviolanthrone, 2-ethyl-9,10-bis(phenylethynyl)anthracene; 2-chloro-9,10-bis(4-ethoxyphenyl)anthracene; 2-chloro-9,10-bis(4methoxyphenyl)anthracene; 9,10-bis(phenylethynyl) anthracene; 1-chloro-9,10-bis(phenylethynyl)anthracene; 1,8-dichloro-9,10-bis(phenylethynyl)anthracene; 1,5-dichloro-9,10-bis(phenylethynyl)anthracene; 2,3-dichloro-9,10-bis(phenylethynyl)anthracene; 5,12-bis(phenylethynyl)tetracene; 9,10-diphenylanthracene; 1,6,7,12-tetraphenoxy-N,N'-bis(2,6-diisopropylphenyl)-3,4,9,10-perylene dicarboximide; 1,6,7,12-tetraphenoxy-N,N'-bis(2,5-di-t-butylphenyl)-3,4,9,10-perylene dicarboximide; 1,7-di-chloro-6,12-diphenoxy-N,N'-bis(2,6-diisopropylphenyl)-3,4,9,10-perylene dicarboximide; 1,6,7,12-tetra(p-

bromophenoxy)-N,N'-bis(2,6-diisopropylphenyl)-3,4,9,10-pe rylene dicarboximide; 1,6,7,12-tetraphenoxy-N,N'-di-neopentyl-3,4,9,10-perylene dicarboximide; 1,6,7,12-tetra(p-t-butylphenoxy)-N,N'-dineopentyl-3,4,9,10-perylene dicarboximide; 1,6,7,12-tetra(o-chlorophenoxy)-N,N'-bis(2,6-diisopropylphenyl)-3,4,9,10-perylene dicarboximide; 1,6,7,12-tetra(p-chlorophenoxy)-N,N'-bis(2,6-diisopropylphenyl)-3,4,9,10-perylene dicarboximide; 1,6,7,12-tetra(o-fluorophenoxy)-N,N'-bis(2,6-diisopropylphenyl)-3,4,9,10-perylene dicarboximide; 1,6,7,12-tetra(p-fluorophenoxy)-N,N'-bis(2,6-diisopropylphenyl)-3,4,9,10-perylene dicarboximide; 1,6,7,12-tetraphenoxy-N,N'-diethyl-3,4,9,10-perylene dicarboximide; 1,7-dibromo-6,12-diphenoxy-N,N'-bis(2-isopropylphenyl)-3,4,9,10-perylene dicarboximide; 16,17-dihexyloxyviolanthrone; rubrene; 1,4-dimethyl-9,10-bis(phenylethynyl)anthracene.

7. The multiple-part marking system according to claim 1, wherein the at least one fluorescer is present in an amount ranging from 0.05 percent to 0.9 percent by weight, based on the total weight of the two-part composition.

8. The multiple-part marking system according to claim 1, wherein the at least one inorganic salt is present in an amount ranging from 0.1 percent to 30 percent by weight, based on the total weight of the two-part composition.

9. The multiple-part marking system according to claim 1, wherein the at least one peroxide is chosen from hydrogen peroxide; sodium peroxide; sodium perborate; sodium pyrophosphate peroxide; urea peroxide; histidine peroxide; t-butyl-hydroperoxide; peroxybenzoic acid, and sodium percarbonate.

10. The multiple-part marking system according to claim 1, wherein the at least one peroxide is present in an amount ranging from 0.25 percent to 25 percent by weight, based on the total weight of the two-part composition.

11. The multiple-part marking system according to claim 1, wherein the at least one catalyst is present in an amount ranging from 0.0005 percent to 0.5 percent by weight, based on the total weight of the two-part composition.

12. The multiple-part marking system according to claim 1 further comprising at least one carrier present in an amount ranging from 5 percent to 95 percent by weight, based on the total weight of the two-part composition.

13. A chemiluminescent and thermal marker comprising hollow flexible tubing comprising:

a) at least one first part comprising at least one oxalate ester, at least one fluorescer, and at least one inorganic salt, wherein the at least one inorganic salt is

chosen from sodium thiosulphate, potassium thiosulphate, cobalt acetate, copper acetate, lead acetate, cupric chloride, ferric chloride, calcium iodide, potassium iodide, and silver nitrate;

b) at least one sealed glass vial comprising therein at least one second part comprising at least one peroxide and at least one catalyst chosen from sodium salicylate, lithium salicylate, 5-chlorolithium salicylate , triazoles, substituted triazoles, imidazoles, and substituted imidazoles;

wherein the at least one sealed glass vial is comprised within the at least one first part, and wherein breaking the at least one sealed glass vial will cause the at least one first part and the at least one second part to mix and react together.

14. A projectile comprised of a multiple-part chemiluminescent and thermal marker within the projectile, wherein the multiple-part chemiluminescent and thermal marker comprises

at least one first part comprising at least one oxalate ester, at least one fluorescer, and at least one inorganic salt, wherein the at least one inorganic salt is chosen from sodium thiosulphate, potassium thiosulphate, cobalt acetate, copper acetate, lead acetate, cupric chloride, ferric chloride, calcium iodide, potassium iodide, and silver nitrate;

at least one breakable barrier separating the at least one first part from at least one second part comprising at least one peroxide and at least one catalyst chosen from sodium salicylate, lithium salicylate, 5-chlorolithium salicylate, triazoles, substituted triazoles, imidazoles, and substituted imidazoles;

wherein light and heat are emitted when the at least one breakable barrier is broken.

15. A projectile according to Claim 14, wherein the multiple-part chemiluminescent and thermal marker comprised within the projectile is housed in hollow flexible tubing, wherein the at least one first part is present within the tubing, and wherein the flexible tubing also comprises at least one sealed glass vial containing the at least one second part; and wherein the parts are mixed as a result of the tubing being flexed and the glass vial breaking and releasing the at least one second part.

16. A method of marking a target comprising:

a) launching a projectile containing a multiple-part chemiluminescent and thermal marking system according to Claim 14;

b) breaking the at least one breakable barrier between the at least one first part and the at least one second part;

c) generating light and heat as products of the reaction between the at least first part and the at least second part; and

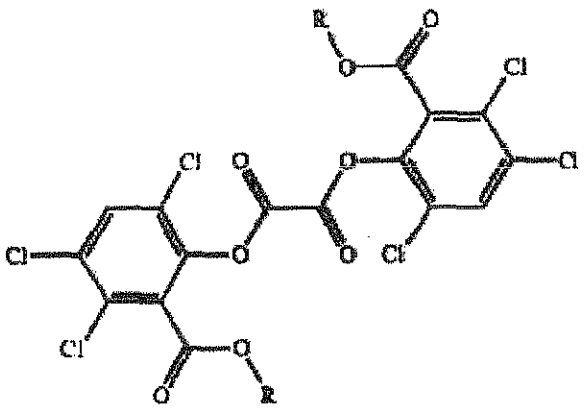
d) marking a target hit by the projectile with the activated multiple-part chemiluminescent and thermal marking system.

WHAT IS CLAIMED IS:

1. A multiple-part marking system that comprises at least one first part comprising at least one oxalate ester, at least one fluorescer, and at least one inorganic salt; and at least one second part comprising at least one peroxide and at least one catalyst chosen from sodium salicylate, lithium salicylate, 5-chlorolithium salicylate, triazoles, substituted triazoles, imidazoles, and substituted imidazoles; wherein light and heat are emitted when the two parts interact; wherein the at least one inorganic salt is chosen from sodium thiosulphate, potassium thiosulphate, cobalt acetate, copper acetate, lead acetate, cupric chloride, ferric chloride, calcium iodide, potassium iodide, and silver nitrate, and wherein the at least one inorganic salt is present in an amount ranging from 0.1 percent to 30 percent by weight based on the total weight of the two-part composition.

2. The multiple-part marking system according to claim 1, wherein the at least one oxalate ester is chosen from bis(2,4,5-trichloro-6-carbopentoxyphenyl)oxalate; bis(2,4,5-trichlorophenyl)oxalate; bis(2,4,5-tribromo-6-carbohexoxyphenyl)oxalate; bis(2,4,5-trichloro-6-carboisopentoxyphenyl) oxalate; bis(2,4,5-trichloro-6-carbobenzoxyphenyl) oxalate; bis(2-nitrophenyl)oxalate; bis(2,4-dinitrophenyl)oxalate; bis(2,6-dichloro-4-nitrophenyl) oxalate; bis(2,4,6-trichlorophenyl)oxalate; bis(3-trifluoromethyl-4-nitrophenyl)oxalate; bis(2-methyl-4,6-dinitrophenyl)oxalate; bis(1 ,2-dimethyl-4,6-dinitrophenyl)oxalate; bis(2,4-dichlorophenyl)oxalate; bis(2,4-dinitrophenyl)oxalate; bis(2,5-dinitrophenyl)oxalate; bis(2-formyl-4-nitrophenyl)oxalate; bis(pentachlorophenyl)oxalate; bis(1 ,2-dihydro-2-oxo-1-pyridyl)glyoxal; bis(2,4-dinitro-6-methylphenyl)oxalate; bis-N-phthalimidyl oxalate.

3. The multiple-part marking system according to claim 1, wherein the at least one oxalate ester is chosen from oxalates represented by the general formula (I)



(I)

wherein R = CH_2A and A is chosen from alkyl chains, alkyl rings, and aromatic rings or combinations thereof, and wherein R is linear or nonlinear, and comprises from 4-15 carbon atoms.

4. The multiple-part marking system according to claim 1, wherein the at least one oxalate ester is chosen from:

bis{3,4,6-trichloro-2-[(2-methylpropoxy)carbonyl]phenyl}oxalate;

bis{3,4,6-trichloro-2-[(cyclopropylmethoxy)carbonyl]phenyl} oxalate;

bis{3,4,6-trichloro-2-[(2-methylbutoxy)carbonyl]phenyl} oxalate;

bis{3,4,6-trichloro-2-[(3-methylbutoxy)carbonyl]phenyl} oxalate;

bis{3,4,6-trichloro-2-[(2,2-dimethylpropoxy)carbonyl]phenyl} oxalate;

bis{3,4,6-trichloro-2-[(2-methylpentyloxy)carbonyl]phenyl} oxalate;

bis{3,4,6-trichloro-2-[(3-methylpentyloxy)carbonyl]phenyl} oxalate;

bis{3,4,6-tri chloro-2-[(4-methylpentyloxy)carbonyl]phenyl} oxalate;

bis{3,4,6-trichloro-2-[(3,3-dimethylbutoxy)carbonyl]phenyl} oxalate;

bis{3,4,6-trichloro-2-[(2-ethylbutoxy)carbonyl]phenyl} oxalate;

bis{3,4,6-trichloro-2-[(cyclopentylmethoxy)carbonyl]phenyl} oxalate;

bis{3,4,6-trichloro-2-[(2-methylhexyloxy)carbonyl]phenyl} oxalate;

bis{3,4,6-trichloro-2-[(3-methylhexyloxy)carbonyl]phenyl} oxalate;

bis{3,4,6-trichloro-2-[(4-methylhexyloxy)carbonyl]phenyl} oxalate;

bis{3,4,6-trichloro-2-[(5-methylhexyloxy)carbonyl]phenyl} oxalate;

bis{3,4,6-trichloro-2-[(cyclohexylmethoxy)carbonyl]phenyl} oxalate;
bis{3,4,6-trichloro-2-[(phenylmethoxy)carbonyl]phenyi} oxalate;
bis{3,4,6-trichloro-2-[(2-phenylethoxy)carbonyl]phenyl} oxalate;
bis(3,4,6-trichloro-2-{[(2-methylphenyl)methoxy]carbonyl}phenyl) oxalate;
bis(3,4,6-trichloro-2-{[(3-methylphenyl)methoxy]carbonyl}phenyl) oxalate;
bis(3,4,6-trichloro-2-{[(4-methylphenyl)methoxy]carbonyl}phenyl) oxalate;
bis(3,4,6-trichloro-2-{[(2,3-dimethylphenyl)methoxy]carbonyl}phenyl) oxalate;
bis(3,4,6-trichloro-2-{[(2,4-dimethylphenyl)methoxy]carbonyl}phenyl) oxalate;
bis(3,4,6-trichloro-2-{[3,4-dimethylphenyl)methoxy]carbonyl}phenyl) oxalate;
bis(3,4,6-trichloro-2-{[(3,5-dimethylphenyl)methoxy]carbonyl}phenyl) oxalate;
bis(3,4,6-trichloro-2-{[(2,6-dimethylphenyl)methoxy]carbonyl}phenyl) oxalate;
bis(3,4,6-trichloro-2-{[(2-ethylphenyl)methoxy]carbonyl}phenyl) oxalate;
bis(3,4,6-trichloro-2-{[(3-ethylphenyl)methoxy]carbonyl}phenyl) oxalate;
bis(3,4,6-trichloro-2-{[(4-ethylphenyl)methoxy]carbonyl}phenyl) oxalate;
bis(3,4,6-trichloro-2-{[2-(2-methylphenyl)ethoxy]carbonyl}phenyl) oxalate;
bis(3,4,6-trichloro-2-{[2-(3-methylphenyl)ethoxy]carbonyl}phenyl) oxalate;
bis(3,4,6-trichloro-2-{[2-(4-methylphenyl)ethoxy]carbonyl}phenyl) oxalate;
bis{3,4,6-trichloro-2-[(2-phenylpropoxy)carbonyl]phenyl} oxalate;
bis{3,4,6-trichloro-2-[(3-phenylpropoxy)carbonyl]phenyl} oxalate;
bis{3,4,6-trichloro-2-[1-naphthalenylmethoxy)carbonyl]phenyl} oxalate;
bis{3,4,6-trichloro-2-[2-naphthalenylmethoxy)carbonyl]phenyl} oxalate;
bis{3,4,6-trichloro-2-[(2,2-diphenylethoxy)carbonyl]phenyl} oxalate;
bis{3,4,6-trichloro-2-[(9-fluorenylmethoxy)carbonyl]phenyl} oxalate; and
bis{3,4,6-trichloro-2-[(9-anthracenylmethoxy)carbonyl]phenyl} oxalate

5. The multiple-part marking system according to claim 1, wherein the at least one oxalate ester is present in an amount ranging from 3 percent to 60 percent by weight, based on the total weight of the two-part composition.

6. The multiple-part marking system according to claim 1, wherein the at least one fluorescer is chosen from 1-methoxy-9, 10-bis(phenylethynyl) anthracene, perylene, rubrene, 16,17 -didecycloxyviolanthrone, 2-ethyl-9, 10-bis(phenylethynyl)anthracene; 2-chloro-9, 10-bis(4-ethoxyphenyl)anthracene; 2-chloro-9, 10-bis(4methoxyphenyl)anthracene; 9, 10-bis(phenylethynyl) anthracene; 1-chloro-9, 10-bis(phenylethynyl)anthracene; 1,8-dichloro-9, 10-

bis(phenylethynyl)anthracene; 1,5-dichloro-9,10-bis(phenylethynyl)anthracene; 2,3-dichloro-9, 10-bis(phenylethynyl)anthracene; 5,12-bis(phenylethynyl)tetracene; 9,10-diphenylanthracene; 1,6,7,12-tetraphenoxy-N,N'-bis(2,6-diisopropylphenyl)-3,4,9,10-perylene dicarboximide; 1,6, 7, 12-tetraphenoxy-N,N'-bis(2,5-di-t-butylphenyl)-3,4,9,10-perylene dicarboximide; 1,7-di-chloro-6,12-diphenoxy-N, N'-bis(2,6-diisopropylphenyl)-3,4,9, 10-perylene dicarboxlmide; 1,6,7,12-tetra(p-bromophenoxy)-N,N'-bis(2,6-diisopropylphenyl)-3,4,9,10-perylene dicarboximide; 1,6,7,12-tetraphenoxy-N,N'-dineopentyl-3,4,9,10-perylene dicarboximide; 1,6,7,12-tetra(p-t-butylphenoxy)-N,N'-dineopentyl-3,4,9,10-perylene dicarboximide; 1,6,7,12-tetra(o-chlorophenoxy)-N,N'-bis(2,6-diisopropylphenyl)-3,4,9,10-perylene dicarboximide; 1,6,7, 12-tetra(pchlorophenoxy)-N,N'-bis(2,6-diisopropylphenyl)-3,4,9,10-perylene dicarboximide;1,6,7,12-tetra(o-fluorophenoxy)-N,N'-bis(2,6-diisopropylphenyl)-3,4,9, 10-perylene dicarboximide; 1,6,7,12-tetra(p-fluorophenoxy)-N,N'-bis(2,6-diisopropylphenyl)-3,4,9, 10-perylene dicarboximide; 1,6,7,12-tetraphenoxy-N,N'-diethyl-3,4,9,10-perylene dicarboximide; 1,7-dibromo-6,12-diphenoxy-N,N'-bis(2-isopropylphenyl)-3,4,9, 10-perylene dicarboximide; 16,17-dihexyloxyviolanthrone; rubrene; 1,4-dimethyl-9, 10-bis(phenylethynyl)anthracene.

7. The multiple-part marking system according to claim 1, wherein the at least one fluorescer is present in an amount ranging from 0.05 percent to 0.9 percent by weight, based on the total weight of the two-part composition.

8. The multiple-part marking system according to claim 1, wherein the at least one peroxide is chosen from hydrogen peroxide; sodium peroxide; sodium perborate; sodium pyrophosphate peroxide; urea peroxide; histidine peroxide; t-butylhydroperoxide; peroxybenzoic acid, and sodium percarbonate.

9. The multiple-part marking system according to claim 1, wherein the at least one peroxide is present in an amount ranging from 0.25 percent to 25 percent by weight, based on the total weight of the two-part composition.

10. The multiple-part marking system according to claim 1, wherein the at least one catalyst is present in an amount ranging from 0.0005 percent to 0.5 percent by weight, based on the total weight of the two-part composition.

11. The multiple-part marking system according to claim 1 further comprising at least one carrier present in an amount ranging from 5 percent to 95 percent by weight, based on the total weight of the two-part composition.

12. A chemiluminescent and thermal marker comprising hollow flexible tubing comprising:

a) at least one first part comprising at least one oxalate ester, at least one fluorescer, and at least one inorganic salt, wherein the at least one inorganic salt is chosen from sodium thiosulphate, potassium thiosulphate, cobalt acetate, copper acetate, lead acetate, cupric chloride, ferric chloride, calcium iodide, potassium iodide, and silver nitrate, and wherein the at least one inorganic salt is present in an amount ranging from 0.1 percent to 30 percent by weight based on the total weight of the two part composition;

b) at least one sealed glass vial comprising therein at least one second part comprising at least one peroxide and at least one catalyst chosen from sodium salicylate, lithium salicylate, 5-chlorolithium salicylate, triazoles, substituted triazoles, imidazoles, and substituted imidazoles; wherein the at least one sealed glass vial is comprised within the at least one first part, and wherein breaking the at least one sealed glass vial will cause the at least one first part and the at least one second part to mix and react together.

13. A projectile comprised of a multiple-part chemiluminescent and thermal marker within the projectile, wherein the multiple-part chemiluminescent and thermal marker comprises at least one first part comprising at least one oxalate ester, at least one fluorescer, and at least one inorganic salt, wherein the at least one inorganic salt is chosen from sodium thiosulphate, potassium thiosulphate, cobalt acetate, copper acetate, lead acetate, cupric chloride, ferric chloride, calcium iodide, potassium iodide, and silver nitrate, and wherein the at least one inorganic salt is present in an amount ranging from 0.1 percent to 30 percent by weight based on the total of the two-part composition; at least one breakable barrier separating the at least one first part from at least one second part comprising at least one peroxide and at least one catalyst chosen from sodium salicylate, lithium salicylate, 5-chlorolithium salicylate, triazoles, substituted triazoles, imidazoles, and substituted imidazoles; wherein light and heat are emitted when the at least one breakable barrier is broken.

14. A projectile according to Claim 13, wherein the multiple-part chemiluminescent and thermal marker comprised within the projectile is housed in hollow flexible tubing, wherein the at least one first part is present within the tubing, and wherein the flexible tubing also comprises at

least one sealed glass vial containing the at least one second part; and wherein the parts are mixed as a result of the tubing being flexed and the glass vial breaking and releasing the at least one second part.

15. A method of marking a target comprising:

a) launching a projectile containing a multiple-part chemiluminescent and thermal marking system according to Claim 13;

b) breaking the at least one breakable barrier between the at least one first part and the at least one second part;

c) generating light and heat as products of the reaction between the at least first part and the at least second part; and

d) marking a target hit by the projectile with the activated multiple-part chemiluminescent and thermal marking system.