CLAIMS

1. A red phosphor, comprising:

an inorganic compound represented by formula (2)

$$Li_e(Ca_aSr_b)_fAl_gSi_jN_uC_xO_wH_v{:}zA \quad (2)$$

wherein A is at least one luminescence activator; wherein $0 < e \leq 0.05$; wherein $0.1 \leq a \leq 0.3$; wherein $0.7 \leq b \leq 0.9$; wherein $(a+b) \leq 1$; wherein $0.75 \leq f \leq 0.9$; wherein $0.8 \leq g \leq 0.91$; wherein $j = 1$; wherein $1.5 \leq u \leq 2.5$; wherein $0.2 \leq x \leq 0.7$; wherein $0.001 < w \leq 0.5$; wherein $0.9*\{(3z/2)-(v/2)\} \leq w \leq 1.1*\{(3z/2)-(v/2)\}$; wherein $0 < v \leq 0.05$; wherein $0 < (x+w) < 3$; wherein $x \neq w$; and, wherein $0.001 < z \leq 0.01$.

2. The red phosphor of claim 1, wherein A is Eu^{2+}.

3. The red phosphor of claim 2, wherein $(1-e) \leq f \leq 1$; wherein $(1-e) \leq g \leq 1$; wherein $1 \leq j \leq (1+e)$; wherein $u=\{3-(4x/3)-h\}$; and, wherein $0.95*\{(3z/2)-(v/2)\} \leq w \leq 1.05*\{(3z/2)-(v/2)\}$.

4. The red phosphor of claim 2, wherein $\{1-(2e)\} \leq f \leq 1$; wherein $g=1$; wherein $j=1$; wherein $u=\{3-(4x/3)-z\}$; and, wherein $0.99*\{(3z/2)-(v/2)\} \leq w \leq 1.01*\{(3z/2)-(v/2)\}$.

5. The red phosphor of claim 1, wherein the red phosphor exhibits an emission spectra having a peak wavelength, $P\lambda_{phosphor}$, between 600 nm and 660 nm upon excitation from a light source exhibiting an emission spectra having a peak wavelength, $P\lambda_{source}$, between 200 nm and 600 nm.

6. The red phosphor of claim 1, further comprising a surface treatment; wherein the surface treatment is applied to a surface of the inorganic compound.

7. A phosphor composition, comprising: a red phosphor according to claim 1; and, a liquid carrier; wherein the red phosphor is dispersed in the liquid carrier.

8. A lighting apparatus for emitting white light comprising:

a light source, wherein the light source produces light having a source luminescence spectrum; and,

a first source luminescence spectrum modifier, wherein the first source luminescence spectrum modifier is a red phosphor according to claim 1;

wherein the red phosphor is radiationally coupled to the light source.

9. The lighting apparatus of claim 8, wherein the source luminescence spectrum has a peak wavelength, $P\lambda_{source}$, between 200 and 600 nm; and, wherein, upon excitation of the red phosphor by exposure to the light produced by the light source, the red phosphor exhibits an emission spectrum having a peak wavelength, $P\lambda_{phosphor}$, between 600 and 660 nm.

CLAIMS

1. A red phosphor, comprising:

an inorganic compound represented by formula (2)

$$Li_e(Ca_aSr_b)_fAl_gSi_jN_uC_xO_wH_v{:}zA \quad (2)$$

wherein A is at least one luminescence activator; wherein H is a monovalent halogen anion; wherein $0 < e \leq 0.05$; wherein $0.1 \leq a \leq 0.3$; wherein $0.7 \leq b \leq 0.9$; wherein $(a+b) \leq 1$; wherein $0.75 \leq f \leq 0.9$; wherein $0.8 \leq g \leq 0.91$; wherein $j = 1$; wherein $1.5 \leq u \leq 2.5$; wherein $0.2 \leq x \leq 0.7$; wherein $0.001 < w \leq 0.5$; wherein $0.9*\{(3z/2)-(v/2)\} \leq w \leq 1.1*\{(3z/2)-(v/2)\}$; wherein $0 < v \leq 0.05$; wherein $0 < (x+w) < 3$; wherein $x \neq w$; and, wherein $0.001 < z \leq 0.01$.

2. The red phosphor of claim 1, wherein A is Eu^{2+}.

3. The red phosphor of claim 1, wherein the red phosphor exhibits an emission spectra having a peak wavelength, $P\lambda_{phosphor}$, between 600 nm and 660 nm upon excitation from a light source exhibiting an emission spectra having a peak wavelength, $P\lambda_{source}$, between 200 nm and 600 nm.

4. The red phosphor of claim 1, further comprising a surface treatment; wherein the surface treatment is applied to a surface of the inorganic compound.

5. A phosphor composition, comprising: a red phosphor according to claim 1; and, a liquid carrier; wherein the red phosphor is dispersed in the liquid carrier.

6. A lighting apparatus for emitting white light comprising:

a light source, wherein the light source produces light having a source luminescence spectrum; and,

a first source luminescence spectrum modifier, wherein the first source luminescence spectrum modifier is a red phosphor according to claim 1;

wherein the red phosphor is radiationally coupled to the light source.

7. The lighting apparatus of claim 6, wherein the source luminescence spectrum has a peak wavelength, $P\lambda_{source}$, between 200 and 600 nm; and, wherein, upon excitation of the red phosphor by exposure to the light produced by the light source, the red phosphor exhibits an emission spectrum having a peak wavelength, $P\lambda_{phosphor}$, between 600 and 660 nm.