$$SO_3(g) + Ca(OH)_2(s) \longrightarrow Ca(SO_4)(s) + H_2O(g)$$

Hydrated lime systems utilizing calcium hydroxide particles are commonly used in operations for continuously treating exhaust gases and removing acidic species.

[0005] One challenge commonly associated with these hydrated lime systems is their relative inefficiency with capturing acidic species from an exhaust gas stream. This inefficiency is due in part to the difficulty of effectively dispersing the calcium hydroxide particles quickly enough within the ducting through which the exhaust stream travels so that the particles can contact the acidic species in the exhaust gases. For example, in those hydrated lime systems that use fine calcium hydroxide particles (e.g., particles with diameters less than 8 microns) with a narrow particle size distribution, the dispersion of those particles within an exhaust ducting can be limited, and often fails to contact sulfur-containing gases at, e.g., the outer edges of the ducting in systems with short residence times. As another example, in those hydrated lime systems that use coarse particles (e.g., particles with diameters above 30 microns), the reactivity of those particles is limited because of their lower surface area to volume ratios, relative to finer particles. In addition to these particle size constraints of fine and coarse, the removal efficiency of calcium hydroxide particles can further be based on the particle surface area, particle size distribution, pore volume, and moisture content, amongst other factors. Accordingly, there exists a need for an improved composition of calcium hydroxide particles to more efficiently remove contaminants from exhaust gases.

SUMMARY

[0005a] In one aspect, there is provided a composition for treating acid gases, the composition comprising:

calcium hydroxide particles including–

a D_{10} from about 0.5 microns to about 4 microns,

a D_{90} less than about 30 microns, and

a ratio of D_{90} to D_{10} from about 8 to about 20,

wherein individual calcium hydroxide particles include a surface area greater than or equal to about 25 m^2/g.

[0005b] In another aspect, there is provided a method of forming a composition of calcium hydroxide-containing particles, the method comprising:

combining particles including calcium oxide (CaO) and water to form calcium hydroxide ($Ca(OH)_2$) particles;

milling the calcium hydroxide particles to reduce particle size diameter of the calcium hydroxide particles; and

drying the calcium hydroxide particles,

wherein the calcium hydroxide particles, after milling and drying, include–

a D_{10} from about 0.5 microns to about 4 microns,

a D_{90} less than about 30 microns,

a ratio of D_{90} to D_{10} of from about 8 to about 20, and

a flow factor index from about 2 to about 4, and

wherein individual calcium hydroxide particles include a surface area greater than or equal to about 25 m^2/g.

[0005c] In another aspect, there is provided a method of treating an exhaust gas having one or more acidic species, the method comprising:

providing a composition having at least 90% calcium hydroxide ($Ca(OH)_2$) particles, wherein the particles include–

a D_{10} between about 0.5 microns and 4 microns,

a D_{90} less than about 30 microns,

a ratio of D_{90} to D_{10} between about 8 and about 20, and

a flow factor index between about 2 and about 4,

wherein individual particles include a surface area greater than or equal to about 25 m^2/g; and

contacting the composition with the exhaust gas to cause the calcium hydroxide particles to react with the one or more acidic species.

BRIEF DESCRIPTION OF THE DRAWINGS

[0006] The written disclosure herein describes illustrative embodiments that are non-limiting and non-exhaustive. Reference is made to certain of such illustrative embodiments that are depicted in the figures, in which:

[0007] FIG. 1 is a flow diagram illustrating a process for forming a hydrated lime product, configured in accordance with embodiments of the present technology.

[0008] FIGS. 2-4 are particle size histograms for exemplary compositions of calcium hydroxide particles, configured in accordance with embodiments of the present technology.