as a TBC, although a TBC may also be added to a substrate in addition to an EBC to further increase the temperature capability of a component.

PCT Application No. PCT/US2009/030826 describes a coating including a calcia-magnesia-alumina-silicate (CMAS)-resistant layer with a rare earth oxide. The CMAS-resistant layer is essentially free of zirconia and hafnia, and may further include at least one of alumina, silica, and combinations thereof.

European Patent Application No. 06256473.7 describes a method for depositing a protective coating upon a substrate including the steps of: dipping a substrate into a slurry composed of an aqueous solution, at least one refractory metal oxide, and at least one transient fluid additive present in an amount of about 0.1 percent to 10 percent by weight of the slurry; heat treating the substrate; and cooling the substrate to form a protective coating thereon.

PCT Application No. PCT/US2005/029889 describes a semiconductor processing component including a substrate and a layer overlying the substrate. The layer has a composition $ReA_yO_{1.5+2y}$, wherein Re is Y, La, a Lanthanoid series element, or a combination thereof, A is $(Si_{1-a}Ge_a)$, $0.25 \leq y \leq 1.2$, and $0 \leq a \leq 1$.

European Patent Application No. 05254949.0 describes a non-line-of-sight process for coating complexed shaped structures of Si-based substrates with protective barrier layers. The coating process comprises the steps of: providing a complex shaped Si-based substrate; applying at least one barrier layer by at least one of electrophoretic deposition and electrostatic deposition; and densifying the barrier layer at a temperature below the melting point of the substrate.

SUMMARY

In general, the disclosure relates to coatings having a bond layer including a rare-earth silicate and a second phase. The second phase may include at least one of silicon, silicides, alkali metal oxides, alkali earth metal oxides, glass ceramics, Al_2O_3, TiO_2, Ta_2O_5, HfO_2, ZrO_2, $HfSiO_4$, $ZrSiO_4$, $HfTiO_4$, $ZrTiO_4$, or mullite. In some embodiments, the inclusion of the second phase may facilitate bonding between the rare earth silicate layer and substrate.

In one embodiment, ~~the disclosure is directed to a coating comprising a bond layer deposited on a substrate. The bond layer comprises a rare earth silicate and a second phase, the second phase comprising at least one of silicon, silicides, alkali metal oxides, alkali earth metal oxides, glass ceramics, Al_2O_3, TiO_2, Ta_2O_5, HfO_2, ZrO_2, $HfSiO_4$, $ZrSiO_4$, $HfTiO_4$, $ZrTiO_4$, or mullite.~~

~~In another embodiment,~~ the disclosure is directed to an article comprising a substrate, wherein the substrate comprises one of a ceramic substrate or superalloy substrate, and a bond layer deposited on the substrate. The bond layer comprises a rare earth silicate and a second phase, the second phase comprising at least one of silicon, silicides, alkali metal oxides, alkali earth metal oxides, glass ceramics, Al_2O_3, TiO_2, Ta_2O_5, HfO_2, ZrO_2, $HfSiO_4$, $ZrSiO_4$, $HfTiO_4$, $ZrTiO_4$, or mullite, wherein the bond layer includes 0.1 percent by weight to 30 percent by weight of the second phase.

~~In another embodiment, the disclosure is directed to a coating composition comprising a rare earth silicate and a second phase. The second phase comprises at least one of silicon, silicides, alkali metal oxides, alkali earth metal oxides, glass ceramics, Al_2O_3, TiO_2, Ta_2O_5, HfO_2, ZrO_2, $HfSiO_4$, $ZrSiO_4$, $HfTiO_4$, $ZrTiO_4$, or mullite.~~

In another embodiment, the disclosure is directed to a method comprising depositing a bond layer on a substrate to form an article. The substrate comprises one of a ceramic substrate or superalloy substrate. The bond layer comprises a rare earth silicate and a second phase, the second phase comprising at least one of silicon, silicides, alkali metal oxides, alkali earth metal oxides, glass ceramics, Al_2O_3, TiO_2, Ta_2O_5, HfO_2, ZrO_2, $HfSiO_4$, $ZrSiO_4$, $HfTiO_4$, $ZrTiO_4$, or mullite, wherein the bond layer includes 0.1 percent by weight to 30 percent by weight of the second phase.

The details of one or more embodiments of the invention are set forth in the accompanying drawings and the description below. Other features, objects, and