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(54) Title: LITHIUM LANTHANUM ZIRCONIUM OXIDE (LLZO) MATERIALS

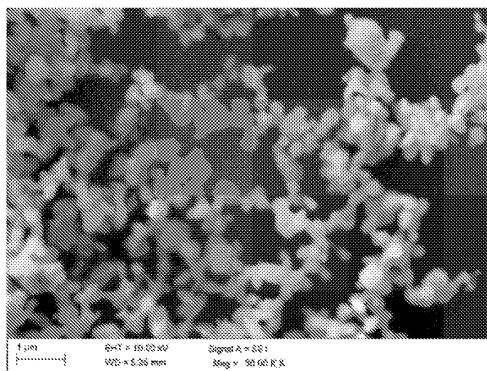


FIG. 5A

(57) Abstract: Disclosed herein are materials and processes for produc-
tion of lithium oxide materials, such as lithium lanthanum zirconium ox-
ide (LLZO), having a small particle size and high density for use in lithi-
um-ion batteries. Some embodiments are directed to forming and then
heating a multiphase material comprising lithium carbonate and $\text{La}_2\text{Zr}_2\text{O}_7$
in the presence of hydrogen gas at a temperature below the melting point
of the lithium carbonate, such that at least a portion of the lithium carbon-
ate decomposes to form lithium oxide. In some embodiments, the lithium
oxide is heated to a temperature sufficient to crystallize the lithium oxide
to form the solid electrolyte material comprising lithium lanthanum zir-
conium oxide (LLZO) particles.

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