Poster

TUNING AEROSOL-ASSISTED VAPOR PHASE PROCESSING TOWARD BULK LOW OXYGEN GaN POWDERS

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The already reported Aerosol-Assisted Vapor Phase Synthesis (AAVS) of GaN powders utilizes affordable oxygen-bearing gallium precursors in aqueous solutions to make raw sub-micron or nano-sized GaN_xO_y powders of spheroidal morphology. In this process, subsequent pyrolysis in an ammonia atmosphere converts such materials to mostly microcrystalline GaN powders that contain some residual oxygen.

Herein, we report studies on the application of various experimental conditions aimed at optimizing the process, specifically, controllling the nitride's residual oxygen content and average crystalline particle sizes to be possibly extended into the nanosized region. The application of suitable heating regimes and appropriate solvents, including methanol, in the raw powder generation stage significantly improved both the progress of nitridation and, eventually, the control over average particle sizes by the application of pyrolysis temperatures in the 900-1000 ºC range. The chemical and crystalline characteristics of the intermediate raw products from various processing schemes were found to have a significant impact on the resulting structural and morphological properties of the final GaN powders. The materials were characterized by XRD, FT-IR, and SEM methods as well as by oxygen content determinations. The characteristics of the AAVS produced materials were compared with those for bulk GaN powders obtained by nitridation of commercial gallium oxide.

The GaN powders with various residual oxygen contents have been used in on-going experiments focused on their sintering/compacting properties and the results of these studies will be reported at a later time.

Acknowledgements. We want to acknowledge a generous support of Polish Committee for Scientific Research KBN, Grant 3 T08D 043 26 and the U.S. National Science Foundation, Grant CHE-9983205.

Keywords: gallium nitride, GaN, nanocrystalline, aerosol technique.