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(54) **METHODS OF FABRICATING GALLIUM NITRIDE SEMICONDUCTOR LAYERS BY LATERAL OVERGROWTH**

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(58) **Field of Search** ..... 438/46, 47, 483, 438/518, 590, 604, 605, 758, 761, 481, FOR 249, FOR 264, FOR 268, FOR 308, FOR 484

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(57) **ABSTRACT**

A gallium nitride semiconductor layer is fabricated by masking an underlying gallium nitride layer with a mask that includes an array of openings therein, and growing the underlying gallium nitride layer through the array of openings and onto the mask, to thereby form an overgrown gallium nitride semiconductor layer. Although dislocation defects may propagate vertically from the underlying gallium nitride layer to the grown gallium nitride layer through the mask openings, the overgrown gallium nitride layer is relatively defect free. The overgrown gallium nitride semiconductor layer may be overgrown until the overgrown gallium nitride layer coalesces on the mask, to form a continuous overgrown monocrystalline gallium nitride semiconductor layer. The gallium nitride semiconductor layer may be grown using metalorganic vapor phase epitaxy. Microelectronic devices may be formed in the overgrown gallium nitride semiconductor layer.

64 Claims, 2 Drawing Sheets