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(54) **Title**: STRAIN ENGINEERED COMPOSITE SEMICONDUCTOR SUBSTRATES AND METHODS OF FORMING SAME

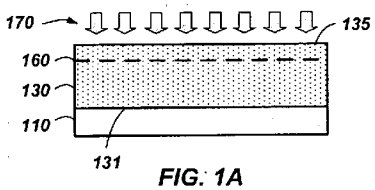


FIG. 1A

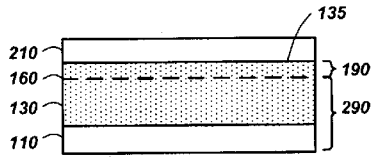


FIG. 1B

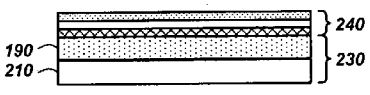


FIG. 1C

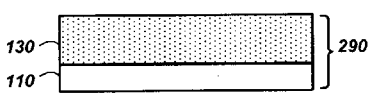


FIG. 1D

(57) **Abstract**: Composite substrates are produced that include a strained Ill-nitride material seed layer on a support substrate. Methods of producing the composite substrate include developing a desired lattice strain in the Ill-nitride material to produce a lattice parameter substantially matching a lattice parameter of a device structure to be formed on the composite substrate. The Ill-nitride material may be formed with a Ga polarity or a N polarity. The desired lattice strain may be developed by forming a buffer layer between the Ill-nitride material and a growth substrate, implanting a dopant or introducing an impurity in the Ill-nitride material to modify its lattice parameter, or forming the Ill-nitride material with a coefficient of thermal expansion (CTE) on a growth substrate with a different CTE.

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