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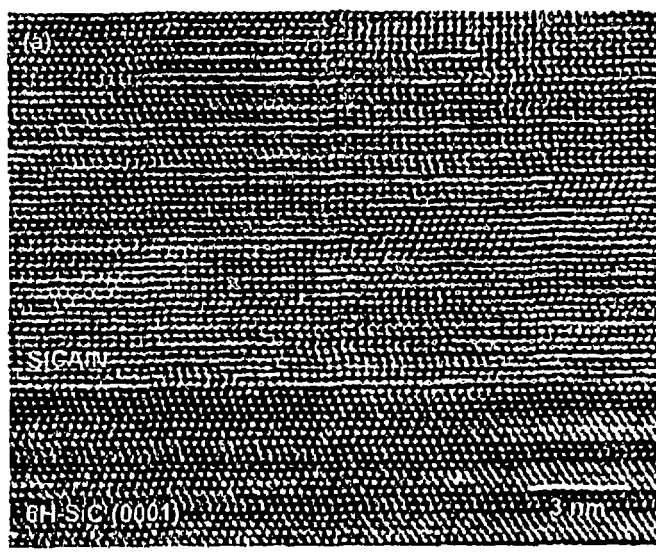
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(54) Title: LOW TEMPERATURE EPITAXIAL GROWTH OF QUATERNARY WIDE BANDGAP SEMICONDUCTORS



(57) Abstract: A low temperature method for growing quaternary epitaxial films having the formula XCZN wherein X is a Group IV element and Z is a Group III element. A Gaseous flux of precursor H₃XCN and a vapor flux of Z atoms are introduced into a gas-source molecular beam epitaxial (MBE) chamber to form thin film of XCZN on a substrate preferably of silicon or silicon carbide. Silicon substrates may comprise a native oxide layer, thermal oxide layer, AlN/silicon structures or an interface of Al-O-Si-N formed from interlayers of Al on the SiO₂ layer. Epitaxial thin film SiCAIN and GeCAIN are provided. Bandgap engineering is disclosed. Semiconductor devices produced by the present method exhibit bandgaps and spectral ranges which make them useful for optoelectronic and microelectronic applications. SiCAIN deposited on large-diameter silicon wafers are substrates for growth of conventional Group III nitrides such as AlN. The quaternary compounds exhibit extreme hardness.

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