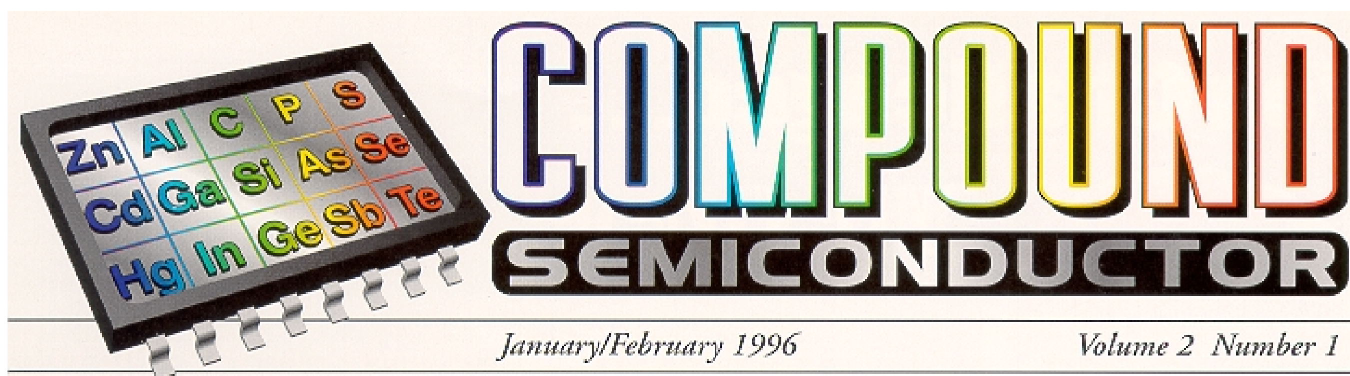

RESEARCH REVIEW

Compound Semiconductor Materials

Growth of Ge-Doped $Al_xGa_{1-x}N$

Direct energy gaps from 3.4 eV to 6.2 eV can be achieved by varying the Al mole fraction in the $Al_xGa_{1-x}N$ alloy. This work reports the growth and doping of $Al_xGa_{1-x}N$ alloys over the composition range $0 < x < 1$ by low-pressure MOCVD. Photoluminescence data for $x < 0.2$ samples displayed sharp band edge emissions and a broad deep-level emission near 2.4 eV. Hall measurements on un-doped AlGaN films showed that the free electron concentration decreases linearly for increasing Al mole fractions while the measured resistivity increases exponentially. Layers with compositions of $x > 0.2$ displayed a resistivity that was too high to be characterized. Ge doping eliminated the deep level emission feature observed in un-doped AlGaN samples, suggesting that this deep level emission may be related to Ga vacancies that could be filled by Ge donor impurities. Work performed at Northwestern University [Evanston, IL USA]. See "Growth of $Al_xGa_{1-x}N$:Ge on Sapphire and Silicon Substrates", X. Zhang et al, Appl. Phys. Lett. 67(12), 1745 [18 September 1995].