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Thermal conductivity reduction by interface roughness in AlN_x-GaN_y superlattices. YEE KAN KOH, Univ of Illinois at Urbana-Champaign, YU CAO, Univ of Notre Dame, DAVID CAHILL, Univ of Illinois at Urbana-Champaign, DEBDEEP JENA, Univ of Notre Dame — A reduction of cross-plane thermal conductivity Λ by a factor of two is achieved in AlN_{4nm}-GaN_{52nm} superlattices by varying the plasma power during growth. This reduction is attributed to interface roughness, introducing a new parameter to be considered in the design and fabrication of superlattices for thermoelectric applications. Thermal conductivity of AlN_x-GaN_y superlattices, x $\sim$ 4 nm and 2 $<$ y $<$ 1000 nm, with rough interfaces is then measured by time-domain thermoreflectance. Λ decreases monotonically as the GaN thickness y decreases, $\Lambda = 6.35$ W m^{-1} K^{-1} at y = 2.2 nm. We observe no minimum thermal conductivity as a function of period for these rough superlattices. A continuum model incorporating the effects of interface roughness indicates that diffuse scattering is dominant when y $>$ 20 nm, and significant coherent transmission occurs when y $<$ 20 nm.

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