Metal-semiconductor nanoheterostructures with an AlGaN quantum well and in-situ formed surface Al nanoislands

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We report on fabrication and studies of composite heterostuctures consisting of an $Al_{0.55}Ga_{0.45}N/Al_{0.8}Ga_{0.2}N$ quantum well and surface Al nanoislands, grown by plasma-assisted molecular-beam epitaxy on *c*-sapphire substrates. The influence of a substrate temperature varied between 320 and 700°C on the size and density of the deposited Al nanoislands is evaluated. The effect of Al nanoislands on decay kinetics of the quantum well middle-ultraviolet photoluminescence has been investigated by time resolved photoluminescence. The samples with the maximum density of Al nanoislands of $10^8\,cm^{-2}$ and lateral dimensions in the range of $100-500\,nm$ demonstrated shortening of the photoluminescence lifetime, induced by interaction of the emitting quantum well and the plasmonic metal particles.

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