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(54) **HIGH BANDGAP III-V ALLOYS FOR HIGH EFFICIENCY OPTOELECTRONICS**

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CPC ***H01L 33/04*** (2013.01); ***H01L 33/005*** (2013.01); ***H01L 33/0066*** (2013.01); ***H01L 33/12*** (2013.01); ***H01L 33/305*** (2013.01)

(58) **Field of Classification Search**
CPC B82Y 20/00; H01L 33/04; H01L 33/005; H01L 33/12; H01L 33/305; H01L 33/0066; H01L 33/32; H01L 33/06; H01L 33/007; H01L 33/08; H01L 33/0079; H01L 21/0254
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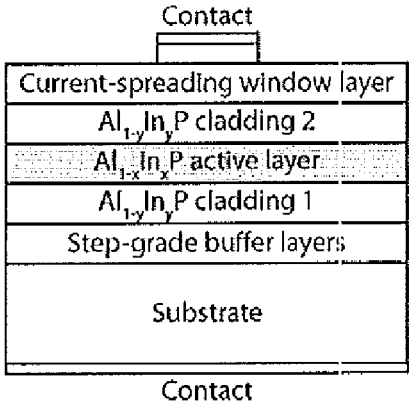
(57) **ABSTRACT**

High bandgap alloys for high efficiency optoelectronics are disclosed. An exemplary optoelectronic device may include a substrate, at least one $Al_{1-x}In_xP$ layer, and a step-grade buffer between the substrate and at least one $Al_{1-x}In_xP$ layer. The buffer may begin with a layer that is substantially lattice matched to GaAs, and may then incrementally increase the lattice constant in each sequential layer until a predetermined lattice constant of $Al_{1-x}In_xP$ is reached.

20 Claims, 2 Drawing Sheets



Doping Options		Carrier Confinement	
		Composition-controlled	Order-controlled
p^-	n^+	$y < 0.56$	$\eta = 0, y = x$
p^-	n^-	$x > 0.56$	$\eta > 0$
n^+	p^+	$y < 0.56$	$\eta = 0, y = x$