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(54) **METHOD FOR FORMING MONOLAYER GRAPHENE-BORON NITRIDE HETEROSTRUCTURES**

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CPC ***C23C 16/342*** (2013.01); ***C01B 31/0453*** (2013.01); ***C01B 31/0484*** (2013.01); ***C01B 35/14*** (2013.01); ***C23C 16/26*** (2013.01); ***C30B 25/02*** (2013.01); ***C30B 25/18*** (2013.01); ***C30B 29/02*** (2013.01); ***H01L 21/0243*** (2013.01); ***H01L 21/0254*** (2013.01); ***H01L 21/0259*** (2013.01); ***H01L 21/0262*** (2013.01); ***H01L 21/02425*** (2013.01); ***H01L 21/02433*** (2013.01); ***H01L 21/02444*** (2013.01); ***H01L 21/02499*** (2013.01); ***H01L 21/02527*** (2013.01)

(58) **Field of Classification Search**

None

See application file for complete search history.

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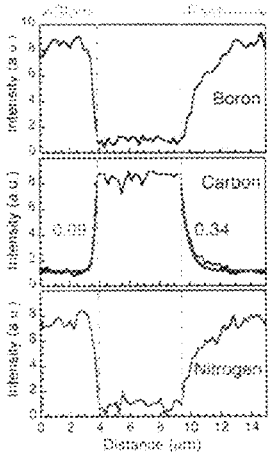
(57) **ABSTRACT**

A method for fabricating monolayer graphene-boron nitride heterostructures in a single atomically thin membrane that limits intermixing at boundaries between graphene and h-BN, so as to achieve atomically sharp interfaces between these materials. In one embodiment, the method comprises exposing a ruthenium substrate to ethylene, exposing the ruthenium substrate to oxygen after exposure to ethylene and exposing the ruthenium substrate to borazine after exposure to oxygen.

19 Claims, 12 Drawing Sheets