Sulfide Passivation of InAs(100) Substrates in Na_2S Solutions

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Abstract—Treatment of the InAs(100) surface with a 1*M* aqueous solution of sodium sulfide (Na_2S) is found to result in the removal of a natural oxide layer from this surface with the formation of a continuous chemisorbed passivating layer of sulfur atoms that are coherently bonded to indium atoms of the crystal surface. No etching of the InAs surface in the sulfide solution occurs. The passivated InAs samples are characterized by a multiple increase in the photoluminescence intensity. The sulfide layer is desorbed from the InAs surface at temperatures of ~400°C. This leads to the formation of a clean In-stabilized (100) surface with a (4 × 2) reconstruction. A simple technique is developed using sulfide passivation for preparing atomically smooth (2 × 4) growth surfaces of the InAs(100) substrates that are suitable for molecular-beam epitaxy of highly perfect layers of compounds based on CdSe.

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