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TMAH wet etching of silicon micro- and nano-fins for selective sidewall epitaxy of III-Nitride semiconductors LIANCI LIU, DENIS MYASISHCHEV, VLADIMIR KURYATKOV, SERGEY NIKISHIN, MARK HOLTZ, Texas Tech University, RUSTY HARRIS, Texas A&M University — We describe formation of silicon micro- and nano-fins, with (111)-plane sidewall facets, for selective sidewall epitaxy of III-Nitride semiconductors. The fins are produced by wet etching (110)-oriented silicon wafers. Silicon dioxide is deposited using plasma enhanced chemical vapor deposition for producing a hard mask. The silicon dioxide is patterned using photo- and electron-beam lithography for micro- and nano-fins, respectively, followed by wet etching in hydrofluoric acid. Wet etching to produce the silicon fins is carried out using tetramethyl ammonium hydroxide (TMAH) diluted with isopropyl alcohol (IPA). Atomic force microscopy and scanning electron microscopy are used to determine morphology including the surface roughness of the area between fins and the etching rate of silicon. We tune the etching time, temperature, and percentage of IPA in order to get the best surface on both (111) and (110) planes. Adding IPA is found to alter the etch rate and improve the surface between the fins without adversely affecting the sidewall morphology.

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