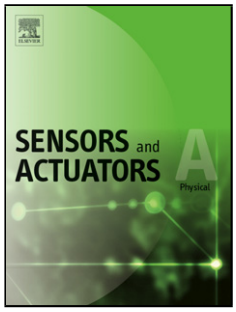

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Effect of molecular structure of alcohols on wet anisotropic etching of silicon

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Highlights

- Si (100) surface etched with alcohol larger than propanol exhibits hillocks coverage.
- Convex corners etched with various alcohols are defined by {221} planes.
- Length and branching of alcohol molecules chains have an impact on Si etch rates.
- Surface tension, contact angle and etch rate decrease as alcohol length increases.

Abstract

The study concerns anisotropic etching of silicon (100) and (110) planes in potassium hydroxide aqueous solutions saturated with different monohydric alcohols (C_3H_7OH, C_4H_9OH and $C_5H_{11}OH$). The main goal of the research is to systematically examine the influence of length and branching of alcohol molecules alkyl chains on etching process. The etch rate ratio R(100)/R(110) > 2 and (110) planes having zigzag pattern are obtained as a result of etching in KOH solutions with all considered alcohols. Additionally, it is demonstrated that convex corners of spatial structures etched in aforementioned solutions are probably formed by exact or vicinal {221} planes. It is shown that for alcohols whose molecules have more than 3 carbon atoms the Si (100) surface is covered with pyramidal hillocks after etching. Moreover, the etch rate of (110) plane decreases as the alcohol molecules alkyl chain becomes longer and more branched. The attempt to explain the impact of molecular structure of different alcohols on the Si etch rates is made, based on results of surface tension and contact angle measurements.

Keywords: wet etching, silicon, KOH, alcohol, contact angle, surface tension

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