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Open Air Silicon Deposition by Atmospheric Pressure Plasma under Local Ambient Gas Control¹ TERUKI NAITO, NOBUAKI KONNO, YUKIHISA YOSHIDA, Mitsubishi Electric Corporation — In this paper, we report open air silicon (Si) deposition by combining a silane free Si deposition technology and a newly developed local ambient gas control technology. Recently, material processing in open air has been investigated intensively. While a variety of materials have been deposited, there were only few reports on Si deposition due to the susceptibility to contamination and the hazardous nature of source materials. Since Si deposition is one of the most important processes in device fabrication, we have developed open air silicon deposition technologies in BEANS project. For a clean and safe process, a local ambient gas control head was designed. Process gas leakage was prevented by local evacuation, and air contamination was shut out by inert curtain gas. By numerical and experimental investigations, a safe and clean process condition with air contamination less than 10 ppm was achieved. Si film was deposited in open air by atmospheric pressure plasma enhanced chemical transport under the local ambient gas control. The film was microcrystalline Si with the crystallite size of 17 nm, and the Hall mobility was $2.3 \text{ cm}^2/\text{V}\cdot\text{s}$. These properties were comparable to those of Si films deposited in a vacuum chamber.

¹This research has been conducted as one of the research items of New Energy and Industrial Technology Development Organization “BEANS” project.

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