■ 연구논문 요약문

논문제목	Ranking process parameter association with low yield wafers using spec-out event network analysis
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개요	- In the semiconductor process, the time-series process sensor data such as temperature, pressure, and voltage, are analyzed, to find suspicious process parameters associated with low yield wafers. A common approach is to compute correlation between individual spec-out events and defect ratios. However, the downside with this approach is that it ignores interactions among spec-out events, leading to each spec-out event being independently administrated. In this paper, we propose a novel approach that incorporates the interactions among spec-out events using spec-out event network analysis. We construct a weighted directed graph in which a specout event is represented as a node, a precedence relation between events as a directed edge, and the wafer defect ratio corresponding to the relation as an edge weight. In this graph, a more important node in the process will have more links from other succeeding nodes with high defect ratios. The PageRank algorithm run on this event network results in a ranking of association with wafer defects. We validated the performance using real-production data from a 32 nm device. The proposed method enables process engineers to determine the root causes of low yield wafers due to the interactions of the process steps.
연구결과	- Based on the link structure between the spec-out sensors obtained from the mass event logs, we proposed a novel graph based approach to find the critical spec-out sensors associated with defective wafers. The proposed approach does not calculate the defect ratio by the spec-out event; instead, it estimates the interactions in order to assess the impact of the event on the event network.
활용분야 및 기대효과	- The main contribution of this study is as follows. This is, to authors' knowledge, the first attempt to analyze the complex inter-relationship among the process steps, equipments and sensors in the semiconductor manufacturing process. PageRank algorithm provides a deeper understanding and better prediction than more traditional approaches employing correlation analysis and regression analysis. This study provides a new tool for analyzing the "between unit processes" issue which has been difficult. It is believed that this study provides a new perspective to broaden the yield analysis and equipment control of the unit process to fab. Based on this analysis, one can immediately respond to the occurrence of anomalies through continuous monitoring on the basis of the data visualized; we seem to be able to address the issue and provide insight. A limitation to