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Hierarchical Sequential Partial Least Square Modeling for Determining Yield and Critical Process Steps in Device Manufacture – Hideaki Ogihara

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The result of every process step in semiconductor device fabrication directly impacts the overall device yield. In any given fabrication line, each process tool has many operational variables and there are multiple process tools. This results in many independent and interacting variables that can potentially influence line yield. Historically, partial least squares methods have been successful in modeling individual process tools in a single process step. Although it is theoretically possible to relate all of the operational variables through the use of PLS, any PLS model of the full fabrication process has such a large dimension that it becomes computationally unworkable. Multivariate models having large numbers of variables are difficult to interpret since plots become extremely cluttered, making overall trends nearly impossible to detect and quantify.

For sequential processes, each process is partitioned as a block of logically related variables and then hierarchical data analysis is applied. We show how Top PLS models can be used to predict the final yield and to determine the critical process steps and find the causes of low yield problems.

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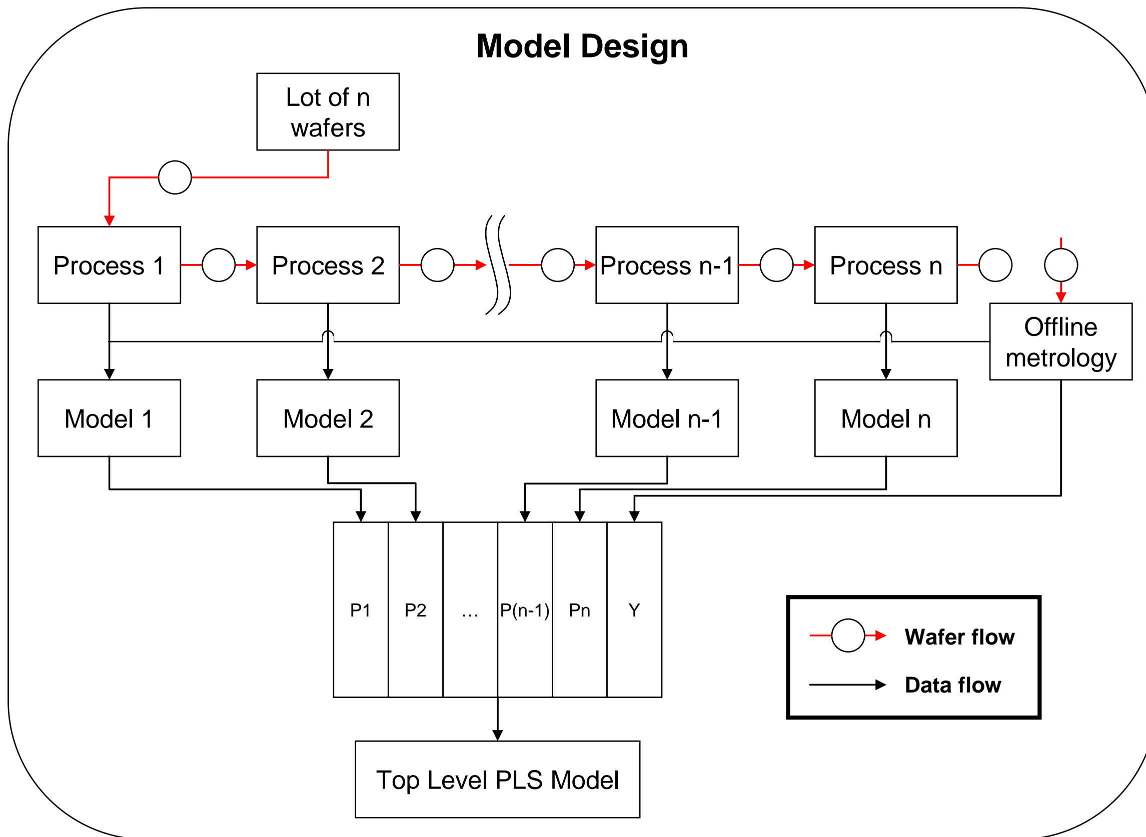

Figure 1