St. Venant Effects in Microelectronic Structures

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Abstract. Structures encountered in modern microelectronic integrated circuits are complex composites with sizes in the micrometer/nanometer range. End effects (also termed St. Venant effects) play an important role in the mechanical response of these structures and dictate the transfer of strain between the constituent materials. The stress/strain distributions within such systems influence many properties of the integrated circuit, from the enhanced device speed of strained silicon systems to the mean-time-between-failure rate of the system due to thermal fatigue. While many analytical models have been developed to describe these stress distributions, there is a paucity of experimental results. We present diffraction stress measurements from model structures and compare these results to the predictions of various analytical and finite element formulations..