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A model for comprehensive studies of porosity in mesoporous low-k dielectrics

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The successful integration of a low-dielectric-constant (low-k) material as an interlayer dielectric (ILD), as well as its resistance to a hostile (chemical, thermal, radiation, etc.) environment depends on the morphology of the embedded porosity. This is a preliminary comprehensive study based on a simple percolation model, which is applied to represent randomly packed non-interacting hard (non-overlapping) spheres (pores). Analysis of the number of connected and isolated pores is used to evaluate the pore connectivity at a given porosity below the onset for percolation. These results are related to some of the presently available ILD candidates for the 0.13 μm feature-size generation. The importance of the percolation threshold, at which an "infinite" pore cluster is formed, will be assessed in the light of the requirements given in the *International Technology Roadmap for Semiconductors*. The feasibility of the model for studying changes in material properties and the possibilities for future developments will be discussed.