

Room Temperature Direct Wafer Bonding for Three Dimensional Integrated Sensors

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This paper reviews the state-of-the-art in room-temperature direct wafer bonding and its application to sensors and materials. The fundamental physical and chemical mechanisms that allow bond energies exceeding 1 J/m^2 to be obtained are discussed. Different techniques and configurations compatible with typical semiconductor production ambient conditions are described and compared to alternate bonding technologies. A variety of test structures and reliability results are presented illustrating the efficacy of the technology. A number of different types of sensor applications including substrates for sensor fabrication, the encapsulation of fabricated sensors, and the integration of sensors in three-dimensional systems demonstrate appropriate utilization of the technology.

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