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(54) Title: ALUMINUM OXIDE CRYSTALLIZATION BARRIER FOR HYBRID BONDING

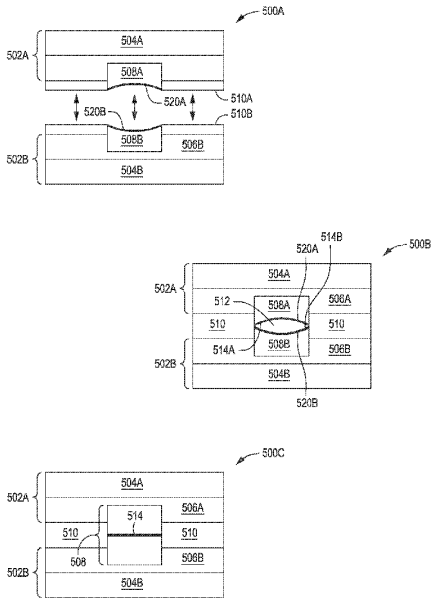


FIG. 5

(57) Abstract: A method for substrate processing for hybrid bonding that includes forming an aluminum oxide crystallization barrier on a metal contact. In some embodiments, the method may include providing a substrate in preparation for a hybrid bonding process where the substrate has an aluminum oxide (Al_2O_3) bonding layer on an uppermost surface of the substrate and a metal contact is present in the aluminum oxide bonding layer. A crystallization barrier is formed on an uppermost surface of the metal contact. The crystallization barrier disrupts crystallization of the aluminum oxide bonding layer caused by interaction of the aluminum oxide material of the aluminum oxide bonding layer and a metal material of the metal contact during a subsequent annealing process of the hybrid bonding process.

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