IMPROVED CHARACTERIZATION METHODS FOR UNIPOLAR DIRECTLY BONDED SEMICONDUCTOR JUNCTIONS

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The paper describes an improved version of the characterization methods for unipolar directly bonded junctions previously proposed by the present authors in (1, 2). In its previous form, the methods permitted simultaneous determination of the energy density of interface states at the bonded interface and doping-concentration profile in its vicinity in a laterally uniform junction. However, it has been soon recognized that the transverse conductivity of real directly bonded junctions is strongly affected by "punctures" present in their interfacial barrier, and this effect largely distorts the characterization results yielded by the methods (1, 2).

In the present work, we propose a new regular procedure that allows one to separate out the electric current that flows through the "punctures" from the total electric current across the whole structure. With this procedure, it now becomes possible to independently determine the spreading resistance of the system of interfacial "punctures" and improve the estimate of parameters for the areal part of the structure with the potential barrier. As a result, we obtain a new method that permits representation of a real directly bonded junction with a barrier height continuously fluctuating over the junction area with an equivalent structure that contains just two parts: quasi-ohmic "punctures" and a main bonded area with a laterally uniform barrier. This representation makes it possible to trace the impact of various technological and external factors on the electrical parameters of the two parts of the structure individually.

REFERENCES

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2. V. A. Stuchinsky and G. N. Kamaev, Semiconductors, **34**, 1163 (2000).