

molecular matrix with fixedly built-in active molecules and clusters which are the localization centers of the tunneling electrons and establish single-electron tunneling junctions is followed by additional polymerization of the molecular structure.

TUNNEL-EFFECT DEVICE AND A METHOD FOR PREPARING SAME

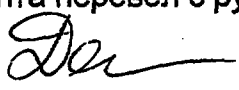
Abstract

The tunnel-effect device comprises an input electrode 3, an output electrode 4, and N control electrodes 5 separated with tunneling barriers, the latter barriers and the interbarrier space therein appear as an ordered structure of molecules and clusters establishing tunneling junctions; each control electrode 5 is located in the region of the ordered structure of molecules and cluster 2. The dimensions and properties of the molecules and clusters provide for single-electron correlated electron tunneling at a relatively high (room) temperature.

The tunnel-effect device functions on the base of controlled correlated electron tunneling. Possibility of controlling the tunneling current opens the way to constructing various electronic gate circuits on the base of single-electron tunneling junctions and hence to preparing single-electron analog and digital devices, in particular, high-sensitivity sensors.

The method for preparing the tunnel-effect device consist in establishing on the surface of a solid-state substrate an input electrode, an output electrode, and control electrodes, followed by formation of an inert dielectric molecular matrix with orderly built-in active molecules and clusters which are the localization centers of the tunneling electrons and thus establish single-electron tunneling junctions.

The effect of discrete tunneling of individual current carriers through tunneling barriers at room temperature used in the tunnel-effect device may also be applied in a single-electron transistor and used for constructing single-electron gate circuits, wherein logical "1" and "0" are identified with the presence or absence of an electron.

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