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Transport properties and non-volatile memory application of self assembled nanoparticle array by microtubules MEI XUE, K.L. WANG, Device Research Laboratary, Department of Electrical Engineering, University of California, Los Angeles, JING ZHOU, BRUCE DUNN, Department of Material Science & Engineering, University of California, Los Angeles — A method of self-assembly of gold nanoparticles with the diameter of around 1nm is developed by the use of bio species (microtubule) and transport properties of nanoparticle arrays are investigated. Via self-assembly, the attachment sites of gold nanoparticles to the microtubule can be controlled. The density of the gold nanoparticles in our experiments achieved is on the order of $10^9 cm^{-2}$and can be extended to as high as 10^{13} cm^{-2}. A transport bi-stability is observed in a sandwich structure of Au/ MT + gold nanoparticle array / P^+ Si substrate. On the basis of detailed analysis of the temperature and electrical field dependences, a band model incorporating electron-tunneling is suggested to explain the observed bi-stability and other transport characteristics. The retention time is also measured to be larger than 10^5s. The operation and endurance of this memory device are confirmed. With its simple structure and the compatible fabrication process with conventional MOS, this MT/Au nanoparticle array holds a great potential for memory applications.

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