

Will insulators replace semiconductors?

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Electronic switches are devices that electrically induce a metal insulator transition. In semiconductors, electrons are sufficiently free, and are pulled and pushed by an electric field to change the resistance of the device. However, the free electrons in semiconductors cannot be confined into very small areas, thus limiting device scaling. In insulators, on the other hand, electrons are better confined. Recently, a well-known electric field induced metal insulator transition in oxides is applied for memory cells. Can the same effect also be used for logic ? This talk will review what we have learned about the effect, to promote thinking about this question. Other non-conventional semiconductor technologies studied by our group will also be briefly reviewed.