

عنوان مقاله:

A New Silver-Based Solid State Electrolyte and Fast Ionic Conductor for Electrochemical Memory Devices

محل انتشار:

چهارمین کنفرانس بین المللی علوم و توسعه فناوری نانو (سال: 1399)

تعداد صفحات اصل مقاله: 7

نویسندگان:

Keyvan Khoshabadi - *Electrical and computer Engineering University of Tehran Tehran, Iran*

Sanaz Alikhah - *Electrical and computer Engineering University of Tehran Tehran, Iran*

Negar Karpourazar - *Electrical and computer Engineering University of Tehran Tehran, Iran*

Mahdi Pourfath - *Electrical and computer Engineering University of Tehran Tehran, Iran*

خلاصه مقاله:

With recent advances in artificial intelligence and the rapid rise in big-data, new computer architecture is required to process data much faster and more energy-efficient than the classical von Neuman architecture. One of the alternative methods is neuromorphic systems, which is inspired by human brain functions. Electrochemical transistors are one of the most prominent devices for synaptic electronics due to their symmetrical and linear conductivity responses, high accuracy level and relatively low switching energy. However, these devices suffer from low operating speed due to the slow ionic diffusion in the transistor's electrolyte part. Here, we introduce a silver-based electrolyte material with super-fast ionic conductivity, $\text{Ag}_{10}\text{GeP}_2\text{S}_{12}$, that addresses the speed problem of electrochemical synaptic devices. The density functional theory (DFT) and first-principles calculations were used to study the diffusion of Ag^+ ions in the $\text{Ag}_{10}\text{GeP}_2\text{S}_{12}$ solid state electrolyte. We calculate the ionic conduction of this material to be 70mS/cm , by using ab initio molecular dynamics performed by VASP. The density of states (DOS) of this material is also calculated by PBE method in VASP to determine the bandgap of this material.

کلمات کلیدی:

Molecular Dynamics, Density Functional Theory, Electrochemical transistors, Fast Ionic conductors, Neuromorphic Computation

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