Physical properties of two-dimensional electron gas in bulk $[\text{Ca}_2\text{N}]^+\cdot\text{e}^-\ 2\text{D electride}$

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Electride, which is regarded as a new electronic material, is ionic crystal in which interstitial electrons serve as anions. [1] The physical properties of electrides are determined by the topology of cavities or channels which confine anionic electrons. The confining sites have been restricted to cavities or weakly linked channels of organic systems. In this presentation, the birth of two-dimensional (2D) inorganic electrides, dicalcium nitride, with planar confining structure and its physical properties will be introduced as the first 2DEG system in bulk materials. [2] The layered structured 2D electride, dicalcium nitride, $[\text{Ca}_2\text{N}]^+\cdot\text{e}^-$, was synthesized using conventional solid-state sintering technique and exhibited the transport properties of the two dimensionally confined electron gas. A representative 2D transport characteristic of the material is evidenced by a high electron mobility and long mean scattering time exceeding 500 $\text{cm}^2\cdot\text{V}^{-1}\cdot\text{s}^{-1}$ and 0.6 picoseconds, which are highlighted as the phenomenon of 2D electron gas (2DEG) system in bulky materials. The confined 2DEG in interlayers showed the distinct anisotropic behavior in magnetoresistance and workfunctions, revealing the loosely bound nature of anionic electrons.