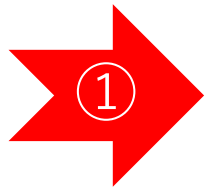


Material Sciences based on the Ionic Liquids

Two topics



Next generation non-volatile memory device, IL-CBRAM

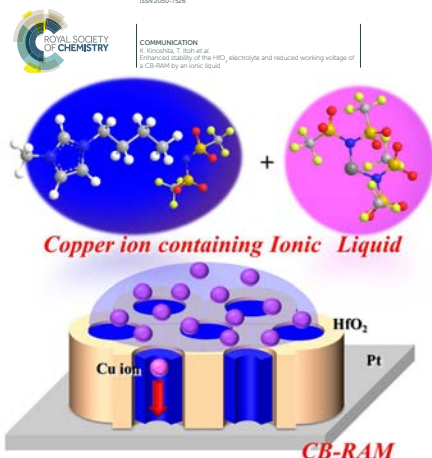
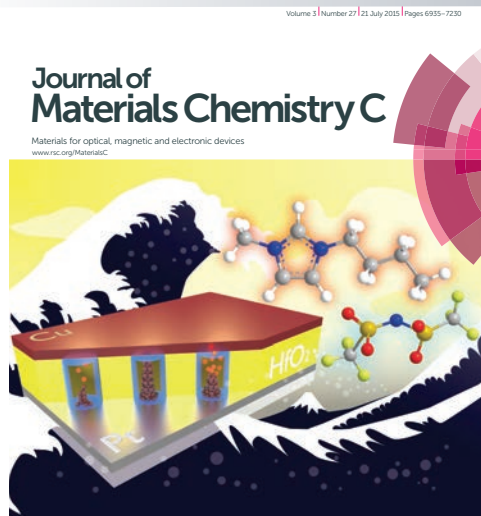


Development of ionic liquids for the liquid desiccant type air conditioner



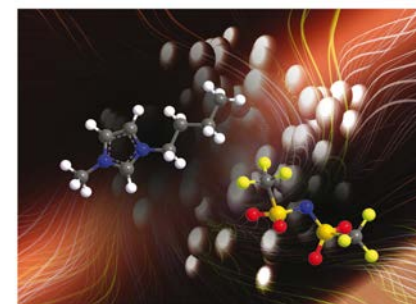
High Speed Non-volatile Memory Device, IL-CBRAM

Research project: Design of ionic liquids for the IL-CBRAM



1. [bmim][TFSA] improved the stability of the HfO₂ in the CBRAM (Cu/HfO₂/Pt) and allowed to reduce the operating voltage.
2. Remarkable improvement of cycling endurance and reduction of operating voltages were accomplished by addition of a Cu(TFSA)₂/ [bmim][Tf₂N] to the HfO₂ film of the Cu/HfO₂/Pt cell.
3. Addition of Cu-doped Triglyme (G3) also drastically improved performance of the CBRAM

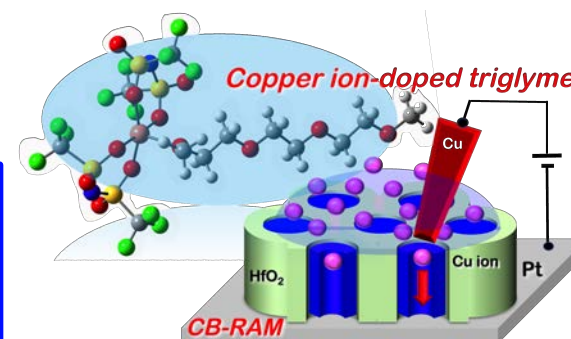
IL-CBRAM: works less than 1 volt with 10⁴-fold faster rate compared to the USB memory devices and enable writing-erasing more than 10⁶ times.



Showing research led by Professor Toshiyuki Itoh at Tohoku University, Japan.
Improved performance of a conducting-bridge random access memory using ionic liquids
In this report, ionic liquids make it possible to provide high-performance CB-RAM that has low switching voltage and high cycling endurance.



www.rsc.org/MaterialsC



J. Mater. Chem. C **2015**, *3*, 6966 ; *Chem. Lett.*, **2015**, *44*, 1578; *J. Mater. Chem. C* **2016**, *4*, 7215 ; *Chem. Lett.* **2017**, *46*, 1832; *Jpn. J. Appl. Phys.* **2017**, *56*, 04CE13.

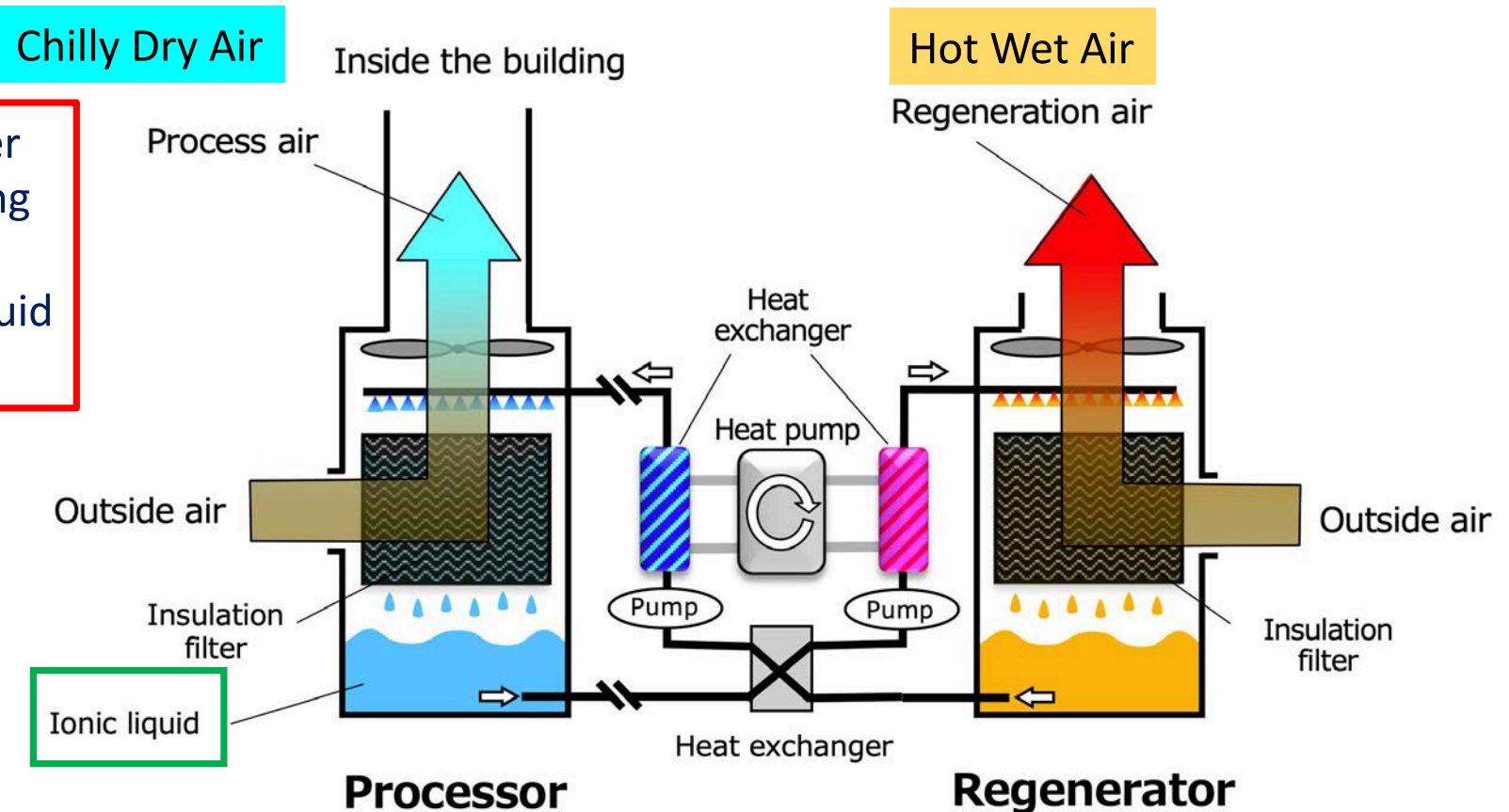


Ionic liquids-Air Conditioning System

Research project: Design of ionic liquids as liquid desiccants for air conditioning system based on the moisture absorbance-release mechanism of IL aqueous solution.

Our air-conditioner model system using an IL aqueous solution as the liquid desiccant [1].

We expect that the system might significantly contribute to reducing the energy consumption of our modern life.



[1] *Green Energy & Environment*, 2019, 4, 139-145.