Molecular Based Multiferroic Materials: Challenges & Opportunities and Design of efficient 3d-metal catalyst for CO_2 reduction into methanol

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The depletion of fossil fuels, population growth and rapid industrial expansion demands an alternative, sustainable energy sources which is the need of an hour.[1] Ferroelectric/Multiferroic materials, stand out for their potential in harnessing the abundant mechanical energy, promising amplified power output for devices used in power plants and wearable electronics.[2] Among the various applications magnetoelectric multiferroics, low power consumption high density storage devices found to be the most attractive one. Compared to the conventional bulks oxides, discrete metal complexes emerge as an potential alternative offering molecular-level adaptability crucial for enhanced energy harvesting and easy incorporation of ferroic orders (ferromagnetic, ferroelectric, ferroelastic) in a single-phase system. The advantage and challenges involved in developing molecular based devices for energy harvesting (mechanical, thermal, vibrational and stray magnetic field) and high density information storage devices will be discussed.[3-6] Besides, the importance of coordinatively unsaturated 3d-metal catalyst for the efficient conversion of CO_2 into methanol under mild condition will be discussed.[7]

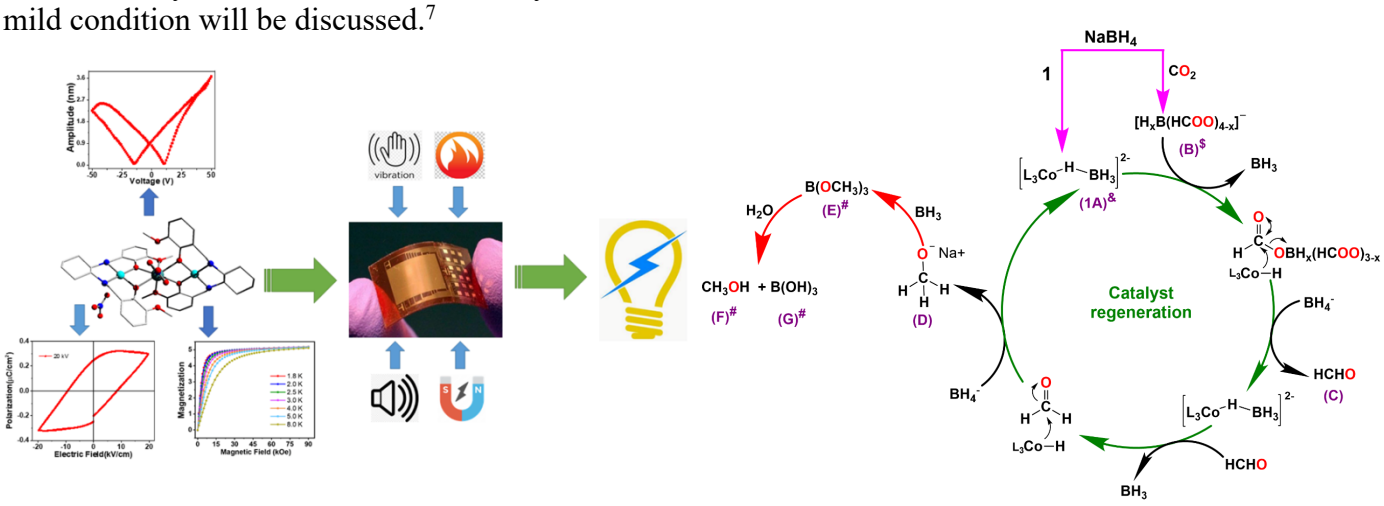

Figure 1 Molecular multiferroic systems and for capturing various forms of energies (vibration/thermal /acoustic/magnetic) and converting them into electrical energy (left panel). Proposed mechanistic cycle for CO2 reduction into methanol.

References:

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