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תוכנית האנרגיה ע"ש גרנד

The Laboratory for Organic and Inorganic Chemistry

Monday, December 23rd at 11:30, Faculty of Chemistry Hall 1

Alkaline Ocean-Based Carbon Dioxide Removal: Leveraging Earth's Carbon Reserves for Efficient, Direct Sequestration through Electrochemical Mineralization

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The urgent need for carbon dioxide removal (CDR) is emphasized in the latest IPCC report, which highlights that to limit global temperature increase to below 2°C above preindustrial levels, we must remove between 450 Gt and 1.1 Tt of CO_2 from the atmosphere using negative carbon capture technologies by 2100. This seminar explores the innovative potential of alkaline ocean-based carbon dioxide removal (mCDR) through electrochemical mineralization which has been conceptualized, developed and tested in this research, which enables leveraging Earth's natural carbon reserves for direct and efficient CO_2 sequestration.

The study involves developing computational models to simulate seawater chemistry using PHREEQC, and calculating both the thermodynamic minimum energy and the overall energy requirements for the process. A comprehensive system is designed and constructed, comprising an electrochemical cell and a mineralization chamber, supported by a complete system design and detailed mass and energy balances.

Experimental results are compared with theoretical predictions, providing insights into the technical assessment of the scalability and feasibility of the approach. The findings demonstrate the potential of direct sequestration through carbonate mineral formation to achieve the required scale of the CDR challenge, while adhering to scaling laws such as the technology-deployment law and the Sherwood principle.