Canadian Association of Physicists
Association canadienne des physiciens et physiciennes

Contribution ID: **3728** Type: **Oral (Non-Student) / Orale (non-étudiant(e))**

Stability of carbon-rich materials for climate-change-mitigation applications

Monday 19 June 2023 16:45 (15 minutes)

Understanding the kinetics and thermodynamics of the crystallization processes involved in carbon-rich materials is a critical knowledge gap that hinders a realistic assessment of the risks and benefits of potential climate-change-mitigation strategies [1]. Toward this end, we investigated the thermal and aqueous stabilities of single-phase and multi-phase mixtures of calcium carbonate and magnesian carbonate, including both laboratory-synthesized and biogenic sources. Building on earlier work from our group [2], we use a suite of materials characterization techniques (including infrared spectroscopy, differential scanning calorimetry, and thermogravimetric analyses) to track changes to the solid phases over time after thermal treatments and/or exposure to water-based solutions. Our results are framed in the context of how to design experiments that help to identify - and ultimately reduce - the uncertainties and associated risks associated with climate mitigation strategies that rely on controlling carbonate mineral formation.

[1] Basic Energy Sciences Roundtable: Foundational Science for Carbon Dioxide Removal Technologies (Brochure). United States: 2022. Web. doi:10.2172/1868525.

[2] B. Gao and K. M. Poduska. Solids 2022. 3(4) 684-696. doi: 10.3390/solids3040042.

Keyword-1

carbon-based materials

Keyword-2

materials physics

Keyword-3

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Session Classification: (DCMMP) M3-8 Materials Physics | Physique des matériaux (DPMCM)

Track Classification: Technical Sessions / Sessions techniques: Condensed Matter and Materials Physics / Physique de la matière condensée et matériaux (DCMMP-DPMCM)