Rajdeep Dasgupta

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EDUCATION

- Ph.D. (Geology), University of Minnesota, USA. 2006
- M.Sc. (Applied Geology), Jadavpur University, India. 2000
- B.Sc. (Geological Sciences), Jadavpur University, India. 1998

APPOINTMENTS

07/20-present: MAURICE EWING ENDOWED CHAIR IN EARTH SYSTEMS SCIENCE – Dept. of Earth, Environmental and Planetary Sciences, Rice University
07/15-present: PROFESSOR – Dept. of Earth, Environmental and Planetary Sciences, Rice University
07/13-06/15: ASSOCIATE PROFESSOR – Department of Earth Science, Rice University
07/08-06/13: ASSISTANT PROFESSOR – Department of Earth Science, Rice University
09/06-06/08: POSTDOCTORAL FELLOW – Lamont-Doherty Earth Observatory (LDEO), Columbia University

RESEARCH EXPERIENCE

Our work unravels physical and chemical processes of the Earth and other planetary interiors and their surface manifestations, with a particular emphasis on the role of melting and differentiation on the origin and evolution of the Earth and other terrestrial planets including the origin and long-term cycles of life-essential volatile elements. Many of our research projects use laboratory experiments for simulating high pressure-temperature conditions relevant for planetary interiors and various analytical techniques to characterize synthesized and occasionally natural samples, for comparison. We also integrate thermodynamic and geochemical modeling. My group members and I have published on the topics, including but not limited to: the role of carbonates on mantle melting; carbon, sulfur, and water cycling in subduction zones; genesis of intraplate basalts via melting of a heterogeneous mantle; melt-rock interactions in basalt source regions and in the lithospheric mantle; sulfur, carbon, nitrogen, and hydrogen solubility and speciation in silicate melts with application to transport and outgassing of these life-essential elements in and from planetary interiors in different tectonic settings; melting in martian mantle. Finally, a lot of work over the last 5+ years have gone onto constraining carbon, sulfur, and nitrogen fractionation during planet formation and metal-silicate-atmosphere differentiation.

PROFESSIONAL SOCIETY MEMBERSHIPS

- American Geophysical Union (since 2001)
- Mineralogical Society of America (since 2002)
- Geochemical Society (since 2002)
- Geological Society of America (since 2013)

AWARDS AND HONORS

Jubilee Chair Professorship, *Indian Academy of Sciences – Bengaluru, India* (2022); Fellow, *Mineralogical Society of America* (2019); James B. Macelwane Medal, *American Geophysical Union* (2014); Fellow, *American Geophysical Union* (2014); Faculty Early CAREER Award, *US National Science Foundation* (2013); Hisashi Kuno Award, *American Geophysical Union - Volcanology, Geochemistry, Petrology section* (2012); F.

W. Clarke Medal, *Geochemical Society* (2011); Packard Fellowship for Science and Engineering, *The David and Lucile Packard Foundation* (2010); UNIVERSITY GOLD MEDAL, *Jadavpur University (FIRST rank at M.Sc. in Applied Geology)* (2000); UNIVERSITY GOLD MEDAL, Jadavpur University (*FIRST rank in B.Sc. in Geological Sciences*) (1998)

SELECTED PUBLICATIONS ($POST-DOCS, †GRAD STUDENTS, ‖UNDERGRADS, AND ‖INTERNS OF DASGUPTA GROUP AND *UNDERGRADS/GRADS MENTORED AT OTHER INSTITUTIONS)

†Lara, M. & **Dasgupta, R.** (2022). Carbon recycling efficiency in subduction zones constrained by the effects of H_2O-CO_2 fluids on partial melt compositions in the mantle wedge. *Earth and Planetary Science Letters* **588**, 117578. doi:10.1016/j.epsl.2022.117578

Dasgupta, R., †Chowdhury, P., †Eguchi, J., $Sun, C., †Saha, S. (2022). Volatile-bearing partial melts in the lithospheric and sub-lithospheric mantle on Earth and other rocky planets. *Reviews in Mineralogy and Geochemistry* **87**, 575-606. doi:10.2138/rmg.2022.87.12

†Grewal, D. S., **Dasgupta, R.**, Hough, T. & Farnell, A. (2021). Rates of protoplanetary accretion and differentiation set nitrogen budget of rocky planets. *Nature Geoscience* **14**, 369-376. doi:10.1038/s41561-021-00733-0

†Grewal, D. S., **Dasgupta, R.** & Marty, B. (2021). A very early origin of isotopically distinct nitrogen in the inner Solar System protoplanets. *Nature Astronomy* **5**, 356-364. doi:10.1038/s41550-020-01283-y

$Sun, C. & **Dasgupta, R.** (2020). Thermobarometry of CO_2-rich, silica-undersaturated melts constrains cratonic lithosphere thinning through time in areas of kimberlitic magmatism. *Earth and Planetary Science Letters* **550**, 116549. doi:10.1016/j.epsl.2020.116549

†Eguchi, J., Seales, J. & **Dasgupta, R.** (2020). Great oxidation and Lomagundi events linked by deep cycling and increased degassing of carbon. *Nature Geoscience* **13**, 71-76. doi:10.1038/s41561-019-0492-6

†Grewal, D. S., **Dasgupta, R.**, $Sun, C., $Tsuno, K. & Costin, G. (2019). Delivery of carbon, nitrogen, and sulfur to the silicate Earth by a giant impact. *Science Advances* **5**, eaau3669. doi:10.1126/sciadv.aau3669

Dasgupta, R. (2018). Volatile bearing partial melts beneath oceans and continents – where, how much, and of what compositions? *American Journal of Science* **318** (1), 141-165. doi:10.2475/01.2018.06

†Duncan, M. S. & **Dasgupta, R.** (2017). Rise of Earth's atmospheric oxygen controlled by efficient subduction of organic carbon. *Nature Geoscience* **10**, 387-392. doi:10.1038/NGEO2939

$Li, Y., **Dasgupta, R.**, $Tsuno, K., Monteleone, B. & Shimizu, N. (2016). Carbon and sulfur budget of the silicate Earth explained by accretion of differentiated planetary embryos. *Nature Geoscience* **9**, 781-785. doi:10.1038/ngeo2801

$Jégo, S. & **Dasgupta, R.** (2014). The fate of sulfur during fluid-present melting of subducting basaltic crust at variable oxygen fugacity. *Journal of Petrology* **55**, 1019-1050. doi:10.1093/petrology/egu016

Dasgupta, R. (2013). Ingassing, storage, and outgassing of terrestrial carbon through geologic time. *Reviews in Mineralogy and Geochemistry* **75**, 183-229. doi:10.2138/rmg.2013.75.7

Dasgupta, R., †Mallik, A., $Tsuno, K., Withers, A. C., Hirth, G. & Hirschmann, M. M. (2013). Carbon-dioxide-rich silicate melt in the Earth's upper mantle. *Nature* **493**, 211-215. doi:10.1038/nature11731

†Mallik, A. & **Dasgupta, R.** (2012). Reaction between MORB-eclogite derived melts and fertile peridotite and generation of ocean island basalts. *Earth and Planetary Science Letters* **329-330**, 97-108. doi:10.1016/j.epsl.2012.02.007

$Filiberto, J. & **Dasgupta, R.** (2011). Fe^{2+}-Mg partitioning between olivine and basaltic melts: applications to genesis of olivine-phyric shergottites and conditions of melting in the Martian interior. *Earth and Planetary Science Letters* **304**, 527-537. doi:10.1016/j.epsl.2011.02.029

Dasgupta, R. & Hirschmann, M. M. (2010). The deep carbon cycle and melting in Earth's interior. *Earth and Planetary Science Letters (Frontiers)* **298**, 1-13. doi:10.1016/j.epsl.2010.06.039

Jackson, M. G. & **Dasgupta, R.** (2008). Compositions of HIMU, EM1, and EM2 from global trends between radiogenic isotopes and major elements in ocean island basalts. *Earth and Planetary Science Letters* **276**, 175-186. doi:10.1016/j.epsl.2008.09.023

Dasgupta, R. & Hirschmann, M. M. (2006). Melting in the Earth's deep upper mantle caused by carbon dioxide. *Nature* **440,** 659-662. doi:10.1038/nature04612