

DR. KOUSHICK SEN

Project Scientist 'II'
Hydrothermal Research Group
National Center for Polar and Ocean Research (NCPOR)
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Academic Qualification:

Ph.D (2015): **Geology** from **Wadia Institute of Himalayan Geology**, Dehradun, India
M.Tech. (2009): **Petroleum Exploration** from **Indian School of Mines**, Dhanbad, India
M.Sc.(2007): **Applied Geology** from **Presidency College**, Kolkata, University of Calcutta, India
B.Sc. (2005): **Geology** from **J.K. College Purulia**, Burdwan University, India

Professional career: (from the latest one)

Project Scientist B: National Center for Polar and Ocean Research, Goa. (7th July 2016 – till date)
Extended Senior Research Fellow: Wadia Institute of Himalayan Geology, Dehradun. (2014-16)
Junior & Senior Research Fellow: Wadia Institute of Himalayan Geology, Dehradun (2010-14)

Fields of Scientific Interests:

Mid Ocean Ridge Tectonics and Hydrothermal Mineralization
Electron Probe Micro-Analyzer (EPMA) applications and analyses of various geological samples
Himalayan Geodynamics (Suture Zone ophiolites and mélanges)

Instrumentation and Technical skills:

Quantitative mineralogical characterization. Presently, in-charge of **CAMECA SX-FIVE EPMA at NCPOR**. Received in hand training on **Electron Probe Micro Analyzer (EPMA)** Operation, Maintenance and advanced applications. The training was on basic hardware and CAMECA PEAKSIGHT software which includes SE, BSE, CL image setup and acquisition, WDS setup for qualitative and quantitative analysis, qualitative and quantitative X-Ray mapping techniques, Trace element quantitative analysis etc (Training Instructors: Zack Heinz, Carl Handerson from CAMECA, France).

Isotope Ratio Mass Spectrometry (IRMS) for Oxygen and Carbon Stable Isotope analysis. Received in hand instrumentation training for Oxygen isotope analysis of Silicates minerals (Training Instructor: Zachary Sharp, University of New Mexico).

Laser Raman spectroscopy (Handled LabRAM HR - Horiba Jovin Yvon instrument- 514.5 nm Argon Laser for incipient mineral and volatile phases during PhD)

Participated in **scientific expedition** as exploration geologist on **ORV MGS Sagar Cruise to Mid-Oceanic-Ridges** of Indian Ocean (~200 days in last five years) as part of **Hydrothermal Sulphide Exploration** programme, NCPOR, Ministry of Earth Sciences, Govt of India.

Awards/ Recognitions/ Memberships:

- Qualified Graduate Aptitude Test for Engineering in 2007 (**GATE** 2007)
- Qualified National Eligibility Test in 2011(**CSIR NET JRF** + Lectureship)
- Scholarship from **MHRD** (Ministry of Human Resource, India) during M.Tech (2007-2009)
- **Wadia National Fellowship** Pursuing research (PhD) in Himalayan Geology,
- **International Travel grant** from International Association of Sedimentologists (**IAS**).
- Acting as a **Review Editor** in Structural Geology and Tectonics, part of the journal(s) **Frontiers in Earth Science**.

Publications:

1. **Sen Koushick**, Das Souvik, Mukherjee Barun K, Sen Koushik., 2013, Bimodal stable isotope signatures of Zildat Ophiolitic Mélange, Indus Suture Zone, Himalaya: implications for emplacement of an ophiolitic mélange in a convergent set-up, *International Journal of Earth Sciences*. Vol 102 (7) 2033-2042. (IF- 2.52)
2. Das Souvik, Mukherjee Barun K, Basu A R, **Sen Koushick.**, 2015, “Peridotitic minerals of the Nidar Ophiolite in the NW Himalaya: sourced from the depth of the mantle transition zone and above” *Geological Society, London*, Special Publications. Vol - 412, Issue - SP412. 12. (IF- 3.1)
3. Naveen, S. Sarkar, T. Nirmal Kumar, D. Ray, S. Bhattacharya, A.D. Shukla, H.Moitra, A. Dagar, P. Chauhan, **K. Sen**, S. Das. (2019). Mineralogy and spectroscopy (VIS near infrared and micro-Raman) of chromite from Nidar ophiolite complex, SE Ladakh, India Implications for future planetary exploration. *Planetary and Space Science*, 165, 1-9. (IF- 2.03)
4. **Sen, K.**, Mukherjee, B. K., Manas M., Sen, K., and Mukherjee, S. (2019). Two-stage exhumation of Zildat Ophiolitic Melange rocks, NW Himalaya, India. *Himalayan Geology*, 40(2), 182-189. (IF- 1.29)
5. Souvik Das, Asish R. Basu, Barun K. Mukherjee, Franco Marcantonio, **Koushick Sen**, Satadru Bhattacharya, Robert T. Gregory (2020). Origin of Indus ophiolitehosted ophicarbonates: Isotopic evidence of mixing between seawater and continental crust-derived fluid during Neo-Tethys closure. *Chemical Geology*. (IF- 4.01)
6. Yogesh Ray, Subhajit Sen, **Koushick Sen**, M. Javed Beg, (2021). Quantifying the past glacial movements in Schirmacher Oasis, East Antarctica, *Polar Science*, Volume 30, (IF- 1.92)
7. Prakash, L. S., John, K. P., Resing, J. A., Tsunogai, U., Rao, A. S., **Sen, K.**, Lupton, J. E., Baumberger, T., Prajith, A. and Roy, P. (2022). Volatile-rich hydrothermal plumes over the southern Central Indian Ridge, 24°49' S: Evidence for a new hydrothermal field hosted by ultramafic rocks. *Geochemistry, Geophysics, Geosystems*, <https://doi.org/10.1029/2022GC010452> (IF: 3.624).

Cover Image:

1. **Sen Koushick**, “Section of Nidar Ophiolite, Indus Suture Zone, Himalaya”. Cover Image published in *Geology* (GSA), Vol.45,No.8,2017
2. **Sen Koushick**, “Pseudo-Nodules in Chakrata Formation: A syndepositional record of paleoseismicity”, Cover Photo published in *Himalayan Geology*, Vol.31,No.2,2010.

Conference proceedings:

- 1- Sen Koushick, Mukherjee Barun K, Ghosh Sumit K., 2010, "Heterogeneous behavior of carbonates and its implication on tectonics: study from Sumdo Ophiolitic Melange, NW Himalaya", In Rock Deformation and Structure conference by SGTSG INDIA.
- 2- Sen Koushick, Das Souvik, Mukherjee Barun K., 2011, "Significance of carbonates in Zildat Ophiolitic Mélange, NW Himalaya: a clue to final emplacement" In 14th International Meeting of Carbonate Sedimentologist.
- 3- Sen Koushick, Mukherjee Barun K, Sen Koushik., 2011, "Multiphase deformation of carbonates and their significance, a study from Zildat Ophiolitic Mélange, NW Himalaya", In Geodynamics & Metallogenesis of Indian Lithosphere.
- 4- Sen Koushick, 2011, "Deformation heterogeneity in Zildat Ophiolitic Mélange, Ladakh Himalaya: clue from carbonate (calcite) microstructure", In Indian Monsoon and Himalayan Geodynamics.
- 5- Sen Koushick, Mukherjee Barun K, Sen Koushik., 2013, "Evidences of euxinic conditions and its consequences from the Himalayan ophiolitic mélange", In WIHG-IGU workshop 2013: Modern Prospective in Himalayan Geosciences
- 6- Sen Koushick, "The Dynamics of Subduction Zone Melange in Convergent Set-up.."2014, In WIHG on Himalayan Day Celebration (Received First Prize)
- 7- Sen Koushick & Mukherjee Barun K, 2015, "Occurrences of Titan-augite within alkaline basaltic rocks of Zildat Ophiolitic Mélange, Indus Suture Zone, Himalaya: implications to the origin of subducted oceanic crust" in 30th HKT workshop, WIHG, Dehradun
- 8- Sen Koushick & Mukherjee Barun K, 2017 "OIB alkaline basalt in the Indus Suture Zone, Himalaya: Rifting of the Paleo-Tethys", In National Conference on Polar Sciences, NCAOR Goa
- 9- Koushick Sen, Mahesh N, John Kurian P & Parijat Roy, 2018 "Mantle Shear Zone at eastern part of South West Indian Ridge (SWIR): Tectonic implication" in SCOR-InterRidge conference
- 10- Koushick Sen, Mahesh N, John Kurian P & Parijat Roy, 2018 "Hydrothermal Activities in Diverse Geological setup along Central Indian Ridge near the Rodriguez Triple Junction, Indian Ocean" Association of Exploration Geophysics (AEG 2018)
- 11- Koushick Sen*, Parijat Roy, John Kurian P, Deepak Agarwal, Srinivas A & Surya L , "A comparative study on geological setting of Central Indian Ridge and South West Indian Ridge (near Rodriguez Triple Junction) and its influence on hydrothermal system" (FIGA 2019)
- 12- Koushick Sen, Parijat Roy & John Kurian P, "Evidences of Intra-Segment Oceanic Core Complex (OCC) at 24°50'S, Central Indian Ridge (CIR): A study on hydrothermal prospect" (IGC 2020)
- 13- Koushick Sen, Parijat Roy, John Kurian P , "Fault traces around tectonic and magmatic dominating hydrothermal systems: a study from slow-spreading southern Central Indian Ridge, Indian Ocean" (SAGAR 2020)