Geochemical Modelling in Igneous Petrogenesis: An Introduction to GCDkit – Sita Bora, Department of Geology, Centre of Advanced Study, Kumaun University, Nainital (Email: sitabora@yahoo.com) and Quazi A. Rasool, Department of Geology, Pondicherry University, Pondicherry

A DST sponsored National Workshop/Training Course on “Geochemical Modelling in Igneous Petrogenesis: An Introduction to GCDkit” was convened by Vysetti Balaram, Chief Scientist at CSIR-National Geophysical Research Institute, Hyderabad, during 12–15, January 2013. Fifty-two young researchers and scientists selected from Indian Universities and Research Institutes participated in the training programme. Inaugural session was chaired by Prof. Mrinal K. Sen, Director, CSIR-NGRI and graced by chief guest Prof. V. Rajamani, JNU, New Delhi, and guests of honour and mentors Dr. Vojtìch JanouŠek, Czech Geological Survey, Associate Professor at Charles University, Prague, Czech Republic and Prof. Jean-FranÇois Moyen, Université Jean-Monnet, Saint-Etienne, France. Prof. Sen welcomed the gathering and emphasized the need of handling huge geochemical database and capacity building in the research field of igneous petrology and geochemistry. V. Balaram, Convener of the workshop, explained the reasons for undertaking this training course and highlighted on the spectacular advancements and developments in analytical instrumentation during the last three decades that has contributed to the generation of high quality geochemical data of major, trace and ultra-trace elements including specialised elemental groups such as LILE, HFSE, REE and PGE & Au, etc., in a variety of geological materials. Prof. Rajamani advised the participants to make full use of the timely organized training on principles and applications of “Geochemical Data Toolkit (GCDkit)” software, and to extend the acquired knowledge to fellow researchers in their respective institutions. Prof. Rajamani in his lecture on models of magmatic processes, suggested the need for using isotopic data in addition to the elemental concentrations for reaching a viable genetic and geodynamic model. In an exhaustive lecture series, Dr. Vojtìch JanouŠek spoke on existing software dealing with geochemical data from magmatic rocks and their advantages/limitations, which have been better addressed in the R-language based GCDkit software. The GCDkit has a vast scope and ability to include additional functions and attributes as per requirement. He further mentioned that there is a basic need for geochemist to have strong background of theory and principles of the programme and geochemical nature of any igneous suite in order to use the software more effectively and efficiently. To start with, the recent version of GCDkit (3 beta) with R (2.15.2) was downloaded by all participants. Dr. JanouŠek taught the basics of “R” language and its application to develop the GCDkit software taking a workable example from Sázava pluton, Czech Republic. On the second day, Prof. Moyen spoke on principles and applications of chemical mass-balance while discussing the aspects related to melting and crystallization processes, and making use of GCDkit for modelling such igneous processes. Some exercises were carried out on the spot and tested using GCDkit to suggest a viable petrogenetic model. On third day Dr. JanouŠek and Prof. Moyen demonstrated the several aspects of modelling the magmatic processes and other multi-cationic and normative calculations on GCDkit using a variety of mineral-chemical and whole-rock geochemical data. On the last day, theoretical mathematical approach, which is commonly used in forward and reverse modelling of igneous processes, was applied to some igneous suites; after a thorough discussion and realistic genetic models were formulated.

At the end of each day of workshop, special lectures were delivered by a few eminent Indian geochemists on various aspects of modelling of magmatic rocks and associated ore deposits. Prof. Mihir Deb of Delhi University presented a talk on metallogenic models based on geochemical database. Prof. Santosh Kumar, Kumaun University, Nainital, delivered a talk on some viable models of magmatic processes based on field-petrographic observations, and strongly advocated that petrogenetic models must be consistent with geological observations. Dr. Vijay Kumar, S.R.T.M. University, Nanded, spoke on intricacies of model-sensitive parameters while...
modelling the melting-crystallization processes and cumulate inversion explaining the behaviours of major and trace elements during such processes.

During the valedictory session, Chief Guest Prof. D.M. Banerjee from Delhi University, made an appeal to young researchers to come up with innovative research results and models on the geological terrains, which can be presented before the international audiences during International Geological Congress (IGC), which will be hosted by India in 2020. Prof. Sen congratulated V. Balaram for conducting such a useful training course very successfully, and felt that young researchers would make optimal use of the knowledge gained in this workshop. Janousek and Moyen appreciated the state-of-the-art geochemical instrumentation available at CSIR-NGRI. Both of them came forward to provide further help in upgrading the software in future. Dr. Umesh K. Sharma, Department of Science and Technology (DST), New Delhi, congratulated the participants for taking up their research career in the fields of petrology and geochemistry. He also gave information on the number of research programmes and funding available with DST for the young researchers in Earth Sciences. All participants expressed satisfaction over the academic and organizational components of the workshop and also felt that this experience would be of immense help in their future studies.