BOOK REVIEWS

Indian Placer Deposits. R. Dhana Raju (ed.). Cambridge Scholars Publishing, La-

Amongst diverse types of mineral deposits, the ‘placer deposits’ have the following unique attributes. They (i) are economically important, mechanical, secondary, present or past accumulations/denudations of chemically resistant, stable, hard, heavy minerals with specific gravity of >2.89; (ii) are separated from light minerals by weathering and erosion of diverse geologic source materials; (iii) are transported by moving water and/or air, based on natural gravity; (iv) are deposited for profit in an aquatic and aeolian regime; (v) have been mined since metals were first used by humans; (vi) are mostly of the Phanerozoic age (<542 million years (Ma)) and rarely of older ages (Palaeo-placers); (vii) are formed predominantly in the Cenozoic (<65 Ma), derived from the Mesozoic (<251 Ma) and older primary mineralizations, disseminations, regional background levels and lithified intermediate sources; (viii) occur worldwide at all elevations and at most latitudes, though majority is generally confined to the tropical and subtropical belts and, hence, economically important deposits occur in Australia, India, Brazil, Sri Lanka, Malaysia, Thailand, Myanmar, Vietnam, Mozambique, Sierra Leone, Madagascar, South Africa and Southeast USA; (ix) host many diverse precious, semi-precious, industrial and high-tech heavy minerals and metals, which include gold, platinum and other gemstones, magnetite, ilmenite, rutile, zircon, monazite, xenotime, chrome, cassiterite, columbite-tantalite, sillimanite, garnet, etc. (x) have yielded historically a significant part of the world’s total supply of gold, platinum, tin and dia-
monds; (xi) are presently the source of most of the world’s titanium; (xii) have a wide spectrum of mineralization, including precious, semi-precious, industrial, strategic and critical minerals required for the ornamental, conventional, high-tech and cutting-edge technologies-based industries; (xiii) are easy and less costly to mine, mostly by surface and open-pit mining, as they occur at very shallow depth either at the surface or near-surface; (xiv) have diverse controls, such as the source-rock geology, disintegration of minerals, resistance to weathering, transportation media, gradient, density difference, favourable locales, geomorphology, different environments of lacustrine, fluvi-al, beach, dune, marginal marine, marine and glacial waves and long-shore currents and (xv) have minerals and metals ranging widely in cost from a few hundred US dollars per tonne (e.g. ilmenite, sillimanite and garnet) to a few thousand US dollars per ounce (31.1 g of gold) and carat (200 mg of dia-
mond).

This book has 11 chapters, followed by an eight-page subject index. In chapter 1, Dhana Raju presents an overview of the placers of gold, platinum, diamond and other gemstones; tin, rare metals, rare earths and heavy mineral sand (HMS) deposits, encompassing the historical-economic aspects of placers, their provenance rocks, exploration, mining and post-mining operations. In chapter 2, Sangurmath deals with the primary supergene lateritic and placer gold occurrences, prospects and 42 micro-mines opened up by the ancient/modern artisanal miners over an area of ~1200 km² in the Wayanad–Nilambur sec-
tor, Kerala, within the granulitic terrain of southwest India. These have been known for over two centuries and are the earliest ones explored for gold in India. In chapter 3, Satyanarayana et al. present an account of India’s inland diamond placer and primary deposits/occurrences, their source/host-rocks, geology, geomorphology, distribution, exploration, mining and processing at Majhgawan, the country’s only plant for diamonds, and resources, besides India’s pre-eminent position in the world from the pre-historic times for diamonds and their trading as also some world-famous diam-
monds, such as the Koh-i-Noor. Ramesh Babu presents in chapter 4 a detailed account of the eluvial, deluvial, colluvial and alluvial rare metal (RM: Nb–Ta, Be, Li and Cs) placer deposits, associated with the primary mineralized source rocks – zoned rare metal and rare earth (RMRE) granite.
BOOK REVIEWS

pegmatites and their replacement zones—
in three major pegmatite belts, viz. (i) the
Bastar–Malkangiri Pegmatite Belt (BMPB)
in Chhattisgarh, (ii) the Jharsuguda district
in North Odisha, and (iii) the Holenarsipur
and Nagamangala schist belts in Karnataka,
along with their geology, exploration, RM-
and Sn-mineralogy (columbite–tantalite,
beryl, spodumene, lepidolite and amblygonite,
and cassiterite), mineral chemistry,
resources and mineral processing for
the upgrading, concentration and recovery of
RM minerals in the field-based mobile rec-
covery plants. In chapter 5, Ramesh Babu
gives an account of HREE and LREE river-
ine, small placer deposits in the form
of xenotime and monazite, derived from the
intrinsic granites and pegmatites in the
Chhotanagpur Granite Gneiss Complex
region in parts of Chhattisgarh and Jhark-
hand, along with their geology, explora-
mination, chemistry of RE-minerals and
their concentrations, evaluation and min-
eral processing for recovery, concentration
and up-grading of the RE-minerals. In
chapter 6, Palanivel et al. present some of
the advanced methods of geo-informatics
used to probe lithology, structure, geomor-
phology and location of the placer HMs de-
posits, taking as a case-study the placer
deposits of Kerala. In chapter 7, Chandra-
sekaran et al. present data on the beach
placer heavy mineral deposits of Kerala, in
terms of their geology, geomorphology,
structure, evolution, areal extent, explora-
tion, evaluation, mineralogy, grade, grain
size, chemical characters, resources, min-
ing, production, value-addition, and lake-
bed and offshore resources. In chapter 8,
Chandrasekaran and Murugan document
the shoreline, fluvial and inland red sand
placer HMs deposits (Teris) in Tamil Nadu,
covering the aspects of geomorphology,
geology, exploration, evaluation of the
beach and dune HMS deposits, Teri sand
deposits and fluvial HMS occurrences,
their mining, HM resources, mineralogy
and mineral chemistry of ilmenite, mineral
benefication, production and value-added
products. In chapter 9, Ravi discusses the
shoreline HMS deposits in Andhra Pradesh,
covering aspects of the geology, influence
of hinterland geology and geomorphology
on the HM-grade, exploration, evaluation,
resources, reserves, sedimentological para-
meters, mineralogy and mineral chemistry
of HMs, offshore HMS occurrences, down-
stream industry with value-addition, eco-
nomic prognosis, environmental concerns
and refilling–recycling–reclamation–reuse
(R-4) of the mined areas. In chapter 10,
Ravi deals with the shoreline and inland
HMS deposits/potential occurrences in Odi-
sha, covering the aspects of regional geo-
ology, provenance rocks, geomorphology,
structure, tectonics, exploration and re-
source evaluation of HMs in the major de-
posits and potential occurrences, together
with salient aspects of the mineralogy, tex-
tures, sedimentology, EMP-based mineral
chemistry of HMs and a brief account on the
offshore HM resources and the envi-
ronmental constraints in the study area. In
chapter 11, Dhana Raju documents the
mineral processing of HM deposits with
many flowcharts for separation, concentra-
tion, purification and extraction of both the
individual placer HMs and their contained
valuable metals, together with different
processes to obtain their value-added pro-
ducts, e.g. high-cost, enriched Ti-products
such as synthetic rutile/anatase and Ti-slag
from raw ilmenite sand; rare earth (RE)
products from the major placer RE miner-
als of monazite and xenotime, together
with a list of important uses of the placer
minerals and their valuable metals in both
conventional and high-tech industries as
well as in other fields, such as jewellery,
medicine, defence and green energy.
Though all the figures in the book are in
black and white, a centrespread of 16 colo-
ured figures like geological maps is given
in between the chapters 1 and 2. The book
was dedicated to the late Dr G. Prabhakar
Rao and late Dr K. M. V. Jayaram, two pio-
nee geoscientists of the Atomic Minerals
Directorate for Exploration and Research
(AMD), Department of Atomic Energy,
Government of India, who contributed
immensely to knowledge on the placer min-
eral sand deposits and placer RMRE depo-
sits of India respectively.

I have found the chapters on inland dia-
monds (chapter 3), rare metal pegmatites
(4) and coastal placers of Kerala (7), An-
dhra Pradesh (9) and Odisha (10) to be the
most comprehensive and useful. Chapters
1 (overview) and 11 (mineral processing
and value-addition of placer deposits) are
well written. Chapter 6 lacks depth and the
readers should refer to other comprehensive
books as well. I strongly recommend this
scholarly and well-printed book to the geo-
scientific faculty, research and post-graduate
students in the universities and professionals
in the geo-research organizations and indu-
tries. Librarians of the geoscience depart-
ments and central libraries of institutions
should procure a copy of this excellent book.

BASANT K. Sahu

Department of Earth Sciences,
Indian Institute of Technology Bombay,
Mumbai 400 076, India
e-mail: bksahu@iitb.ac.in