7 SE25-D3-PM2-311-014 (SE25-A063)

Nature of Mineralization and Beneficiation Approach of Low Grade Chromite Ores in Sukinda Ultramafic Complex, Odisha, Eastern India

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The ultramafic rocks of Sukinda valley are intruded into the sedimentary sequence of Iron Ore Supergroup, comprising Sukinda ultramafic complex. The study area (Sukinda ultramafic complex) in Jajpur district, Odisha shares the highest chromite reserve of India which is hosted by various lithounits viz. high magnesite dunite, peridotie and pyroxinites with rare occurrence of nickeliferous laterite. Chromite ores are classified into massive, laminated, powdery, banded and spotted variety on the basis of textural, structural, lithological and mineral chemical studies of all the six chromite bands (band-1 to band-6) present in that area. All the six chromite bands show a typical swelling and pinching characteristics on both of the strike and dip direction. Chromite and dunite occur exhibits clear rhythmic alternation layers with colour variation from black to pale green. Petrographic and EPMA study revealed wide ranges of size variations from 900 µm to 20 µm for subhedral to euhedral chromite grains ranges with brownish to grayish white in colour. Secondary silicates and sulfides minerals such as pyrrhotite, pyrite and pentlandite infiltrate the fracture zones within chromite and exhibiting higher reflectance than the chromite grains. The Cr:Fe ratio as evaluated from the EPMA studies of Sukinda chromite ranges from 2.41 to 3.80 which indicates recovery of Cr_2O_3 up to 70%. Any decrease in value of Cr:Fe from 2.41 recommends higher contents of iron and magnesium which finally alters the pure chromite into ferric or magnesium rich chromite. Mineral chemical studies of chromite exposed that major oxides viz. Cr_2O_3, FeO and MgO content varies from 40-65 wt%, 15-20 wt% and 10-25 wt% respectively. Other oxides include Al_2O_3, SiO_2 and CaO present in a minor amount. Mineral chemistry revealed that chromite from the study area is classified into: Metallurgical, Chemical and Refractory ore which can be used for industrial purposes.

8 SE25-D3-PM2-311-015 (SE25-A012)

Application of a New Method of Sediment Identification to Geoarchaeology: Morphologi G3

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Sediment analysis is a fundamental and most important parameter in geoarchaeology. Sieve sedimentation and laser diffraction methods are the main techniques that have been using to measure the particle size distribution in soil samples. The laser diffraction method is based on measuring the scattered laser beam on particles. Mastersizer (Malvern, UK) is typical of equipment that uses the laser diffraction technique to measure the particle sizes, and have used for most of the geoarchaeological applications. A new technique, Morphologi G3 (Malvern, UK) instrument measures the size, shape and chemical composition of the particles in a sample at the same time. This instrument provides the ability to measure the multiple parameters for an individual particle. These include: surface area (in pixels and micrometres), length, width, aspect ratio, maximum distance, CE diameter, perimeter, circularity, convexity, elongation, solidity, spherical equivalent volume, intensity and X and Y co-ordinates. This is a high sensitivity, high resolution analytical tool for differentiating and characterisation of a particular sample. The Morphologi G3 instrument can also be used as a fully featured manual microscope capable of capturing high-resolution images and providing instant analysis. In addition to the capabilities of the standard Morphologi G3, the Morphologi G3-ID can perform a Raman chemical analysis of a sample. It provides an easy non-destructive method for archaeologists to discriminate samples accurately both on morphologically and chemically at the same time. Thus, Geoarchaeology can get benefit from the application of new or emerging state-of-art analytical instruments to interpret past social and socio-environmental behaviour of the people.

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1 SE09-D3-AM1-327-001 (SE09-A002)

Coseismic Influences of Great Earthquakes on the Polar Drift in the 21st Century

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Using normal-mode summations we calculate the coseismic changes in a suite of global geodynamic quantities produced by all the 43,304 major earthquakes (above Mw 5) that occurred during 1976-2015 from the Global CMT catalogue. Here we focus in particular on the polar motion excitations due to the few greatest earthquakes in the 21st century. The long quest for the signals of coseismic polar motion excitation has been unsuccessful in the later half of the 20th century, mainly because the large earthquakes that were potentially capable of producing significant polar motion excitations occurred around ~1960 when the polar motion measurements were too poor to tell. That changed in the 21st century with a series of large earthquake events; for example, according to calculation the 2004 Sumatra (Mw 9.3) event, the 2010 Chile (Mw 8.8) event, and the 2011 Japan (Mw 9.0) event had respectively shifted the pole position by 7 cm, 8 cm, and 15 cm coseismically, all toward the geographical direction of about ~130°E, amounting to about 10 milliarcseconds of polar shift in that direction. Possible post-seismic deformations may augment to that even more. In comparison, the observed 21st century polar drift was ~70 milliarcseconds in an approximately orthogonal direction of ~20°E, which actually made a near-orthogonal turn away from the steady pole path of the 20th century toward ~80°W due primarily to the glacial isostatic adjustment. We discuss the possible impact of the coseismic result (if taken into account) on the climatic explanations proposed in the literature for the observed pole path of the 21st century.

2 SE09-D3-AM1-327-002 (SE09-A004)