Gas-hydrate Related Authigenic Carbonates from Krishna-godavari (KG) Offshore Basin (Bay of Bengal) Eastern Continental Margin of India

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A variety of gas hydrate related authigenic carbonates from 99 cores (73 short cores (AAS/GH4), 17 long cores (MD-161), 9 deep drilling cores (NGHP-01) have been recovered over a water depths range of 740-2079 m from K-G Basin, Bay of Bengal. These authigenic carbonates have been investigated for their occurrence, stratigraphic distribution and abundance including their mineralogy, morphology. Authigenic carbonates are distributed at different levels within the sediment sequence ranging from 1 mm to 10 cm in diameter and display irregular shapes. X-Ray diffraction and EDS (Energy Dispersive Spectrum) analysis show that carbonates are predominantly soft friable siderites or high-Mg calcite (HMC) and rarely aragonite or low-Mg calcite (LMC) with associated pyrites, barites. The CaCO₃ (wt %) of carbonate nodules range from 36-78. The MgCO₃ mole percentage varies between 4 and 44.5. We have also recorded various types of chemosynthetic shells along with carbonate nodules. Studies on 17 long cores (30-50 m) cores from Marion Dufresne and 9 NGHP/JOIDES deep drilling cores (200-300 m) show that the upper 50 m contain predominantly soft siderites as the major carbonates except one core (MD-161-08 or NGHP/JOIDES/Hole 10D), where HMC is found even in the upper 50 m up to the near surface depths. At site 14A and adjacent site 15A HMC is found between 60-150 mbsf. Deep water drilling cores (7B, 7D) also showed HMC at greater depths (230-260 mbsf). Our observations from the above cores show that the sites with HMC intermixed with siderites are showed massive hydrates associations (NGHP/JOIDES/ Hole 10D, 14A, 15A). Carbon and oxygen isotopic compositions of the authigenic carbonates reported here falls well within the composition range $\delta^{13}C = -51.6$ to -48.8% and $\delta^{18}O = 3.6$ to 4.5‰ (from AAS-GH4-GC-07) and δ^{13} C = -41 to -52 ‰ and δ^{18} O = 2 to 5 ‰ (for site MD-161-08) of methane derived carbonate. These depleted carbon isotopic compositions indicate that the carbon source for the formation of authigenic carbonates were gas hydrates below, and the carbonates were formed from the flow of methane-enriched fluids through fracture network formed because of shale diapirism. Distinctive clusters of stable isotope values as well as trace elemental concentrations (NGHP-01-10D and MD-161-08) regardless of mineralogy imply that carbonate concretions formed in a closed-diagenetic system.

Key words: <u>Authigenic Carbonates</u>; <u>Gas-hydrates</u>; <u>KG Basin</u>; <u>Bay of Bengal</u>; <u>Eastern Continental Margin of India</u>.