

PETROGRAPHY, COMPOSITION, SHOCK METAMORPHISM, AND GEOLOGY OF THE IMPACT FORMATIONS OF THE ICDP DRILL CORE YAX-1, CHICXULUB CRATER, MEXICO. L. Hecht, T. Kenkmann, R. T. Schmitt, D. Stöffler, R. Tagle, and A. Wittmann, Institute of Mineralogy, Museum für Naturkunde, Humboldt-University, 10099 Berlin, Germany, lutz.hecht@rmuseum.hu-berlin.de

Introduction: The drilling Yaxcopoil-1, ~60 km off the impact center [1], exposes 1510 m of lithologies affected by the Chicxulub impact. 795 m of Tertiary sediments are underlain by 100 m of allochthonous suevite-like, very melt rich breccias resting on a obviously displaced megablock unit dissected by impact dike breccias.

Stratigraphy, petrography, and classification of rocks: We distinguish between layered suevite-like breccias, dike breccias and variable deformed units of Cretaceous carbonates with anhydrite intercalations. The suevitic sequence is composed of six units: (1) Upper sorted suevite, (2) lower sorted suevite, (3) upper suevite, (4) middle suevite, (5) brecciated melt rock, (6) lower suevite. Suevitic dike breccias occur near to the top of the megablock unit, one melt rock dike and several polymict clastic matrix dikes below 1300 m.

Deformation and shock metamorphism: The Cretaceous megablock unit displays variable degrees of impact-induced brittle and ductile deformations and post-impact brittle deformation as well as zones enriched in kerogen and oil. The kerogen is of pre-impact origin and got mobilized by impact-induced thermal effects which also induced K-metasomatism in the whole core section below 795 m. Different degrees of tilting of the bedding planes in different sections (10°–50°) indicate 4 subunits of the carbonate-anhydrite strata. The full range of progressive stages of shock metamorphism is observed in crystalline basement clasts of all suevitic layers, in particular PDF's in quartz, recrystallized quartz and feldspar glass, checkerboard plagioclase, and abundant whole rock melt particles.

Lithological composition and chemistry of the polymict impactites: The suevite units as a whole are mixtures of silicate rocks and carbonates as the melt particles in the suevite are, as indicated by their modal and chemical composition. Exsolved carbonate melts in silicate melt bodies are common and carbonate melt bodies occur in the bottom section. All melt components are crystallized. The silicate melts are composed of minor primary plagioclase and pyroxene and abundant sheet silicates as they are affected by hydrothermal alteration and K-metasomatism. The primarily clastic matrix of the suevitic breccias is also altered by this process and by secondary calcite. PGE contents in the suevite layers are extremely low and show non-chondritic element patterns indicating the lack of any detectable contamination by the impactor.

Interpretation: The source material of the upper suevite section is from the deepest excavation zone and was incorporated into the ejecta plume at a late stage when the bulk of the high rising plume and the main mass of the vaporized projectile had disappeared from the impact site and distributed globally. Only these upper 4 suevite units represent ballistic "fallout" material from the ejecta plume. The Lower Suevite (unit 6) was not air-borne but ground surged material deposited as the first layer and then covered with laterally moving and brecciated material (unit 5) from a tongue of coherent melt deposited on the transient cavity wall and quenched during the collapse of the cavity. The fine grain size and the sorting of units 1 and 2 may be due to the combined effects of the atmosphere reentering the crater region and minor aquatic sedimentation.

Reference: [1] Dressler B. O. et al. (2003) *EOS*, 84, 125