

Revisiting the KPg boundary section's impact spherules from Shell Creek, Alabama

DAVID T. KING JR.¹, YUQI LI² AND ZHIDONG XIE²

¹Auburn University

²Nanjing University

Presenting Author: kingdat@auburn.edu

The Shell Creek impact spherules represent altered impact ejecta of the Cretaceous-Paleogene (KPg) boundary. These objects are microtektites, and as such were formerly composed of glass that bears geochemical evidence of both the target and the impactor. Shell Creek impact spherules represent the most easterly outcrop occurrence of Chicxulub's impact ejecta within the KPg impact spherule-strewn field of the U.S. Gulf Coastal Plain. Shell Creek spherules occur within a resedimented, graded sand layer that is overlain by a hummocky-bedded storm sand deposit. Shell Creek's KPg sand unit (~1 m thick) is thus a reworked deposit containing impact spherules that may have been deposited on nearby land and washed out to sea sometime later.

The dark green Shell Creek impact spherules are now "spherule pseudomorphs," which are entirely or almost entirely altered to more stable mineral phases (i.e., nontronitic smectitic clays) and are, in most instances, internally filled by sparry calcite that occupies a former central void. That void is likely to have been made by dissolution of interior impact glass rather than the spherule being originally hollow or there having been a non-glass nucleus. The presence of significant Fe within the diagenetically formed, nontronitic clay comprising the spherules' rim suggests that there was more Fe either in the target or in the impactor than most papers about the Chicxulub event have suggested. If the excess Fe did not come from the impactor (thought to have been a carbonaceous chondrite), and it did not come from any subsequent diagenetic process affecting the clays (unlikely but possible), the only other source for significant Fe in the spherules' smectitic clay would be the target. It is unclear from previous reconstructions of the impact structure itself and modeling studies of the event that significant mafic target material was directly involved, but the nontronitic smectite may suggest otherwise.