Dark reddish organic solids, termed tholins, have been produced by simulating the chemistry present in Titan’s atmosphere. These tholin have been extensively studied and their optical constants match the geometric albedo in the optical region of Titan. None of the previous work have produced tholin in the temperature range 135 to 178 K where tholins in Titan are produced by magnetospheric charged particle, then cool to 70 K during decent and deposit on the ground at 95 K. While tholins descend, chemically active species condense around them and are subjected to long UV and cosmic rays. Thus, tholins in Titan serve as reaction sites.

A surprising result from the Cassini/Huygens mission was the absence of extensive methane/ethane seas on the surface. We expect methane to disappear from Titan only in a million years or so due to photolysis by the VUV.
It is therefore expected that the stable products of CH$_4$ photolysis react with Titan tholin to replenish the CH$_4$ supply in Titan’s atmosphere. Furthermore, the reactions of C$_2$H$_6$ with the explosive materials on the surface of the tholin could incorporate atmospheric C$_2$H$_6$ into the tholin and therefore might reduce the deposition rate of C$_2$H$_6$ onto the ground.

We recently established that irradiation with D atoms would cause processing of tholins. Also, trapped CH$_4$ in Titan ices was observed, and recently, CH$_4$ and NH$_3$ have been found from tholin sputtering.

The result of a laboratory experiment simulating the production of Titan tholin at temperatures close to 178 K and then exposing the tholin to stable product of CH$_4$ under Titan conditions will be reported.