

# Aerogel for Space Exploration

Peter Tsou

Jet Propulsion Laboratory, California Institute of Technology

The last paper for the 4<sup>th</sup> International Symposium on Aerogel was a presentation on the possibility of using aerogel for space missions. The last paper for the 5<sup>th</sup> ISA was a presentation on preparing aerogel for the STARDUST mission. This paper reviews the key contributions of aerogel in space exploration from JPL. Space missions include Sample Return Experiments on Shuttle Get Away Special Missions, Sample Return Experiment on Spacehab II, Sample Return Experiment on the Wake Shield Mission, Mir Sample Return Experiment on Kvant II, Sojourner Rover on the Pathfinder Mission and the primary payload on STARDUST.

Aerogel has proven to be the best hypervelocity intact capture medium and thermal insulator in space. The low-density renders low initial impact shock pressure to better preserve fragile particles. The wide density range allows broad dynamic capture capacity in particle sizes. The high surface area allows the efficient entrapment of volatiles. Metallic oxides aerogel can withstand space environment: thermal cycling, radiation and ionic erosion. Being transparent, identifying small particles is made immensely easier. Aerogel being very light in mass, having high compressive strength and high thermal insulation, server excellent integrated thermal insulation structure.

The use of aerogel in each of the applications is discussed. The unique properties of aerogel and the process of space qualifications are presented. New innovations to meet each mission requirements and challenges are delineated. The expected science return in each of the missions for space exploration is explained.