# Naturally Occurrning Fullerenes in P-T Boundary section from Spiti Valley, India: Links to Global Anoxia events

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Naturally occurring fullerenes were reported two decades ago for the first time in the ~ 1.85 Ga carbonaceous rocks from Shunga province of Russia [1,2]. The association of fullerenes with impact-related rocks and fulgurites suggest that they may be forming under high energy conditions contrary to the initial observation of their finding in Shungites that are resulted due to low grade metamorphism of organic carbon rich rocks. Hence, it appears that natural formation of fullerenes are linked to geochemical processes such as widespread anoxia as well, other than high energy environments.

Fullerenes were earlier reported from the carbonaceous-rich sediments of the Permian-Triassic section from the Spiti valley using electron impact ionization mass spectrometry [3]. These samples also known to have negative $\delta^{13}C$ excursions typical of many P-T boundary sections across the world. Here we reconfirm the presence of natural fullerenes in the carbonaceous-rich sediments of the Spiti valley using micro-Raman and FTIR spectroscopic technique corroborating the above. Further, no evidence was found for the presence of any traces of noble gas such as Helium in these fullerene molecules suggesting that these fullerenes in the Spiti valley carbonaceous samples may not be originated due to any extraterrestrial impact-related event.

Occurrence of fullerenes in geological strata unrelated to impact events especially at ~1.85 Ga (eg. Karelian Shungites) and the Permian-Triassic Boundary (249 Ma; present work) indicate that the role other geochemical processes such as anoxia related to mass extinction events leading to large scale burial of organic carbon are equally important in the formation of natural fullerenes.

[1] Buseck, P. R., Tsipursky, S. J. & Hettich, S. (1992) *Science* **257,** 215–217.

[2] Parthasarathy, G. et al., (1998) *GCA* **62**, 3541

[3] Parthsarathy, G. et al. (2008) 33 IGC, Oslo, 8-14 August 2008.