

Nano scale structural analyses on Turkey/Taiwan originated spiders' cocoons

Semra Ide¹, İlghar Orujalipoor², Wei-Tsung Chuang³, U-Ser Jeng⁴, Yusuf Özcan⁵, Tuncay Türkeş⁶

¹Physics Engineering, Ankara, Turkey, ²Department of Nanotechnology and Nanomedicine, Hacettepe University, Ankara, Turkey,

³National Synchrotron Radiation Research Center (NSRRC), Hsinchu, Taiwan, ⁴Department of Chemical Engineering,

National Tsing Hua University, Hsinchu, Taiwan, ⁵Department of Electricity and Energy, Pamukkale University, Denizli, Turkey,

⁶Department of Biology, Ömer Halisdemir University, Niğde, Turkey

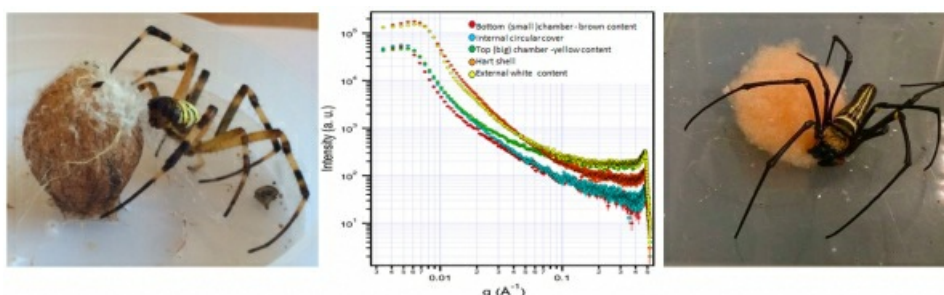
E-mail: side@hacettepe.edu.tr

New approaches related with the usage of spiders' silks and their composites always take much interest for scientists working on interdisciplinary research fields. Natural insect engineering biomaterials may be used as biosuperlens in microscopes [1], acoustic materials in sound systems, and insulators in electrical devices [2] affected by temperature and humidity, beside of their main applications in textile and biomedical industries. Spider species and their different silk types are mainly cause of different nanoscale structure-property relations of these biomaterials [3]. In the present work, under the scope of our collaborative TUBITAK project, several spider species (*Argiope lobata*, *Argiope bruennichi*, *Aculeperia ceropegia*, *Nephila clavipes*, *Cyrtophora citricola*) living in Turkey and Taiwan, and their cocoons were focused as valuable species and rich nanostructured biosamples. SAXS, WAXS, EDXS and SEM methods were used to characterize the structures. The shape, size, distance distributions and electron densities of the nano aggregations in solid and gel forms of the silk samples were also carried out after the SAXS measurements by using SR at BL23A - NSRRC and a Laboratory type SAXS-WAXS (HECUS) system. Nanostructures were compared according to the spider species and the different parts of a complex cocoon structure including different silk forms. The figure shows Turkey and Taiwan originated two species (left-right) and SAXS profiles of the different parts of a cocoon. At the end of the work, the most valuable cocoon samples and the productive spider species were obtained for future domestication process and cocoon production to investigate temperature and humidity dependent electrical properties of these biomaterials for technological investigations. This work was supported by the Scientific and Technological Research Council of Turkey (TÜBİTAK, Grant No: KBAG 214Z049).

[1] Monks, J.N. et al. (2016) Nano Letters, 16(9), 5842-5845.

[2] Tulachan, B. et al. (2014) Sci. Rep. 4, 5434, 1-15.

[3] İde, S. et al. (2011) Spectroscopy, 25, 155-167.



Keywords: [Spider silks](#), [nanostructures](#), [X-ray Analyses](#)