

Fangzhu(方诸) : an ancient Chinese nanotechnology for water collection from air: history, mathematical insight, promises and challenges

C.H. He¹, Ji-huan He¹, and Hamid M. Sedighi²

¹Soochow University

²Shahid Chamran University

May 5, 2020

Abstract

Fangzhu, which has been lost for thousands of years, is an ancient device for water collection from air, its mechanism is unknown yet. Here we elucidate its possible surface-geometric and related physical properties by the oldest the Yin-Yang contradiction. In view of modern nanotechnology, we reveal that Fangzhu's water-harvesting ability is obtained through a hydrophilic-hydrophobic hierarchy of the surface, mimicking spider web's water collection, lotus or desert beetle's water intake. The convex-concave hierarchy of Fangzhu's textured surface enables it to have low wettability(high geometric potential) to attract water molecules from air through the nano-scale convex surface and transfer the attracted water along the concave surface to the collector. A mathematical model is established to reveal three main factors affecting its effectiveness, i.e., the air velocity, the surface temperature and surface structure. The lost technology can play an extremely important role in modern architecture, ocean engineering, transportation and others to catch water from air for everyday use.

Hosted file

fangzhu.docx available at <https://authorea.com/users/299695/articles/429233-fangzhu-%E6%96%B9%E8%AF%B8-an-ancient-chinese-nanotechnology-for-water-collection-from-air-history-mathematical-insight-promises-and-challenges>











