A NEW CLASS OF DENDRIMERIC "GECKO LEGS" POLYMER PARTICLES WITH EXTRAORDINARY STRUCTURE-BUILDING, GELATION AND ADHESIVE CAPABILITIES

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Particulate rheology modifiers are important component of many cosmetics, food, and pharmaceutical formulations. The efficiency of rheology modifiers is usually determined by the interplay between surface area and shape of suspended particles. We will present a new class of nanofibrilated dendrimeric polymer particles (DPPs) with very high surface area and morphology engineered for applications in rheology modifiers and adhesives. The DPPs are fabricated in a novel efficient and scalable process for liquid-based synthesis of nanomaterials by antisolvent precipitation in turbulently sheared medium. The process allows for a variety of polymers to be readily made into DPPs which are hierarchically structured, with a big branched corona of nanofibers spreading out in all directions. The hierarchical structure endows DPPs with high excluded volume. They build a stable three-dimensional network leading to gel-like behavior at fractions as low as 1-2 vol.% of DPPs in various liquids. In addition, the biomimetic similarity of their structure to the gecko lizards' setae endows the DPPs with excellent adhesion and cohesion properties. Our results demonstrate that this strong adhesion and cohesion are attributed to the contact splitting and van der Waals interactions of their nanofibrous structures. This new class of polymeric particles opens new ways to make strong non-covalent binding coatings, new types of dry adhesives, nonwovens and fluid-gels. They could have a transformative role as rheology modifiers and nano-adhesives to hair and skin in many cosmetics formulations.

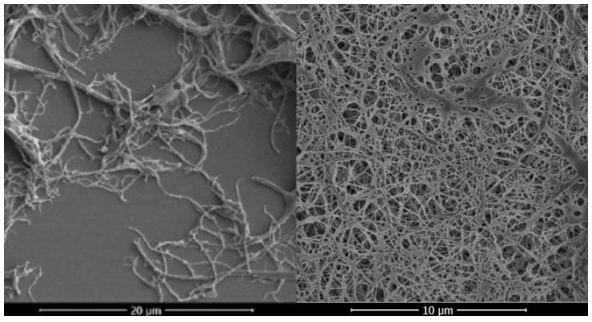

Figure 1 – SEM images of individual dendrimeric particles strongly adhering to a surface and after building up of a strongly adhesive and cohesive superhydrophobic porous layer.