LUNAR AND MARTIAN FIBERGLASS AS A VERSATILE FAMILY OF ISRU VALUE-ADDED PRODUCTS

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Lunar Regolith consists principally of silicates, in some cases as volcanic or impact glasses. We continue to contend that silicon is more versatile in application than all of the other Lunar-available elements combined and shouldn't end up in Lunar slag-heaps and instead should be the fundamental building block for a wide range of value-added products in a CisLunar economy. Fabrication of silicate glasses are conventional industrial processes and anticipated tensile strength of glass made under hard vacuum is an order of magnitude greater than glass produced in atmosphere containing water vapor.

The logic employed in our reasoning includes the fact that any In Situ Resource Utilization (ISRU) effort is going to yield copious masses of silicon oxides which can be used in bulk as conventional glass products or, after further separation, can be synthesized as Silicon and Silicon-Carbide Fullerenes for more exotic applications. Additionally, mechanical wrapping of Silicon Webbing could prove to be more practical and durable and a lot less brittle than attempting large-scale hot glass molding of structural components.

Identified fuel production ISRU efforts yield partially heated masses of metal oxides as waste byproduct – rich in silicates and metal oxides useful in bulk as conventional glass products. Fiberglass manufacturing increases effectiveness of prior ISRU fuel production by taking advantage of mineral benefaction and elevated process exit temperatures. The resulting structures would be spheres and cylinders with various configurations that could apply to human support systems, along with structures useable as storage tanks for the very Oxygen liberated in ISRU applications.

ISRU can manufacture more than fuels: even spacecraft are feasibly and affordably manufactured on Moon based upon fiberglass "tankage" integrated with fiberglass keels. Second-generation structural components may take advantage of Silicon Nanotubes for additional composite strength. Diverse products for human systems support are manufactureable in-situ using glass fibers and fabrics, and CNC-type programmable manufacturing delivering state-of-the-art flexibility of remote design and parts manufacture. These concepts suggest extensibility and evolutionary capability derived when machining tool parts from fiberglass.

Contemporary Terrestrial industrial composite fiber products range from pressure vessels to lightweight sporting goods. A large number of products related to human systems support can similarly be manufactured in-situ using fiber fabric made from lunar silicate glass. Building structures using spun glass would be similar to those currently employed by Raytheon Aircraft or Scaled Composites to build composite aircraft. Pressure containers, structural components, woven fiberglass fabrics, molded and machined solid objects, glass fiber and filament are each large classes of value-added products.