**Answer on Question #68664, Physics / Mechanics | Relativity**

Grains of fine California beach sand are approximately spheres with an average radius of 50 μm and are made of silicon dioxide, which has a density of 2.3 × 103 kg/m3. What mass of sand grains would have a total surface area (the total area of all the individual spheres) equal to the surface area of a cube 0.9 m on an edge?

**Solution**

$$r = 50\mu m$$
$$\rho = 2.3 \cdot 10^3 kg \cdot m^{-3}$$
$$a = 0.9m$$

Surface of the cube is made of 6 squares. Cube surface area is
$$S = 6a^2 = 6 \cdot 0.9 \cdot 0.9 = 4.86(m^2)$$

Surface area of a grain of sand is
$$s = 4\pi r^2 = 3{,}14 \cdot 10^{-8} m^{2.}$$

Number of grains which have the same total surface area as the surface area of a cube is
$$N = \frac{S}{s} = 1.55 \cdot 10^8$$

Mass of a grain is
$$m_0 = \rho \cdot 4/3\, \pi r^3 = 1.20 \cdot 10^{-9} kg$$

Total mass is $m = m_0 N = 0.186 kg$

**Answer: 0.186 kg**