Solid immersion microscopy is a near-field imaging modality that overcomes the Abbe diffraction limit by focusing the light beam behind a high refractive index lens. It offers high energy efficiency, thanks to the absence of any sub-wavelength probes or apertures in the optical path. A favorable combination of superresolution and high optical throughput opens up a variety of imaging applications in different branches of science and technology. The spatial resolution of solid immersion microscopy is mostly limited by the refractive index value of the lens, with optically denser lenses offering higher resolutions. In this paper, bulk rutile (TiO2) crystal is used, for the first time, as a material for the solid immersion lens, which offers an impressive refractive index of ~ 10 in the terahertz range. To our knowledge, this is the highest value of refractive index ever used in solid immersion microscopy. A continuous wave impact ionization avalanche transit-time diode-emitter at the 0.2 THz frequency (the $\lambda = 1.5$ mm wavelength) and a Golay detector were used for building solid immersion microscope. Numerical and experimental studies reveal that our microscope features the spatial resolution parameter as high as 0.06–0.11λ. This is the highest normalized resolution ever reported for any solid immersion imaging systems.