Terbium halides are interesting compounds that are incorporated inside single-walled carbon nanotubes (SWCNTs). The bioimaging with terbium halide-filled SWCNTs is a very promising field. For applications in the bioimaging, it is important to investigate the filling ratio, and the yield of the preparation processes of the nanocomposites. The synthesis of the filled SWCNTs is the chemical process with the melted substances. The melted terbium chloride ($TbCl_3$), terbium bromide ($TbBr_3$), and terbium iodide (TbI_3) are introduced into the SWCNTs in a high-temperature process. It results in the preparation of the compound-containing nanocomposites. The chemical properties of the filled SWCNTs are investigated with transmission electron microscopy (TEM), and spectroscopy. The TEM shows very interesting incorporated compounds. The p-doping of SWCNTs is investigated in the filled SWCNTs. The interesting properties that accompany these nanocomposites may find applications in nanobiotechnology, and bioimaging. In this contribution, we synthesize the terbium halide-filled SWCNTs with the melted compounds. We incorporate the substances into the SWCNTs in the high-yield process. The filling ratios of the SWCNTs are very large as revealed with the TEM. The interesting microstructures of the compounds are found in the TEM images. We demonstrate it with micrographs of the filled SWCNTs. In the terbium halide-filled SWCNTs, p-doping of the SWCNTs is revealed with spectroscopy as modifications of Raman modes. Shifts, intensity variations are observed with the spectra. Therefore, the interesting rare-earth compounds inside SWCNTs form a perspective platform for nanobiotechology, and bioimaging of cells, tissues, and organs.