The deuterium inventory of divertor target tiles used in ASDEX-Upgrade for up to 2000 discharges has been analyzed by thermodesorption spectrometry. In addition, surface analysis techniques as auger electron spectrometry, secondary ion mass spectrometry, nuclear reaction analysis, electron microscopy and optical surface pro®lometry have been applied for investigating erosion and deposition phenomena. The original plasma facing surfaces were graphite (EK98) and plasma sprayed tungsten, respectively. The total deuterium inventories have been found to vary between 4 ´ 1021 D-atoms/m2 and 3 ´ 1023 D-atoms/m2. The deuterium is contained in a deposit on the surface of the graphite and tungsten tiles consisting mainly of carbon, boron and the hydrogen isotopes. There is strong indication that morphological e ects in¯uence impurity deposition, deuterium trapping and re-erosion of the contamination