Biodegradation of volatile chemicals in soil – Separating volatilization and degradation in improved test setup (OECD 307) - DTU Orbit (06/10/2019)

During environmental risk assessments of chemicals, higher tier biodegradation tests in soil, sediment and/or surface water systems are required using standard OECD 307, 308 and 309 guidelines, respectively. These guidelines are not suitable for testing highly volatile chemicals and recommend a biometer closed-incubation setup for testing slightly volatile chemicals. In this setup, degradation kinetics of highly volatile chemicals can largely be influenced by volatilization. Additionally, guidelines lack sufficient information on test system geometry and guidance on how to measure and maintain aerobic conditions during the test. Our objectives were 1) to design a closed test setup for biodegradation tests in soil, where maintaining and measuring of aerobic conditions was possible without the loss of volatile test chemicals and 2) to suggest data treatment measures for evaluating degradation kinetics of volatile test chemicals. With the new setup, full scale OECD 307 tests were performed using the volatile 14C labelled chemicals decane and tetralin. For both test chemicals, reproducible complete mass balances were observed, and the new setup ensured that the volatilization losses were kept below the mineralized fraction. Based on the obtained data an extended model was developed that enabled considering volatilization in the modelling of degradation kinetics.