

# Mineralogy and speciation of environmental iron nanoparticles with the $^{57}\text{Fe}$ Synchrotron Mössbauer Source

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The biogeochemical iron cycle exerts control on the global carbon cycle. Much of this interaction takes place via reactive iron species, which generally occur in the form of colloids and nanoparticles. At the same time, engineered iron nanoparticles gain ever wider importance; from printing to remediation of contaminated groundwater to medical applications. Yet, once released into the environment, their fate is unclear. In both cases, determining the mineralogy of these particles is critical to understand the underlying processes but challenging to achieve with standard methods. Mössbauer spectroscopy can determine the mineralogy of iron-bearing nanoparticles. In dilute systems such as ocean water the difficulty is in obtaining enough material for a Mössbauer measurement. The  $^{57}\text{Fe}$  Synchrotron Mössbauer Source (SMS) enables the analysis of microscopic samples volumes. The necessary sample volumes can be further decreased with a submicron SMS, which may also allow for the investigation of individual particles. The challenge here then lies in designing an appropriate sample manipulation mechanism.