Study on distribution of technetium species and influence factors in groundwater

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Tc is a major components in high-level radioactive wastes. The species distribution of Tc is a key factor to study the transport and deposition behavior in aqueous solution. It is easy to calculate species using geochemical computer program. We have calculated the species distribution of Tc in Beishan groundwater by PHREEQC, The result shows that TcO_4^- is the main specie. Under oxidation condition , the influence of pH to the existing form of Tc is very small, mainly in the form of TcO_4^-. however, under the reducing environmental condition that pe=-3 ~ -0.5, between the range of pH=4.6 ~ 8.8, it is mainly in the form of $TcO(OH)_2$, if it is pH> 8.8, then the mainly form will be TcO_4^-.

Crystal-poor vs. crystal-rich ignimbrites: A competition between stirring and reactivation

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Ignimbrites, providing unique windows into magma reservoirs prior to explosive volcanic eruptions, are of two main types: (1) crystal-rich dacites and (2) dominantly crystal-poor rhyolites. Crystal-rich dacites are typically homogeneous, while crystal-poor ignimbrites can display strong gradients in composition and crystallinity. This presents a conundrum as the more viscous, crystal-rich units should be less prone to mixing. Here we show that this dichotomy reflects the competition between two timescales that follow magma recharge prior to eruption: (1) a thermal reactivation timescale, that measures the time necessary to make a locked crystal mush rheologically eruptible (<50% crystals), and (2) a homogenization timescale associated with convective stirring. Using a thermo-mechanical model, we show that the reactivation timescale of locked mushes is much greater than the time necessary to homogenize reservoirs by convective stirring. Hence, crystal-rich units, which require a reactivation stage, are inevitably well stirred. In contrast, crystal-poor magmas are rheologically ready to be mobilized without reactivation and need not be thoroughly mixed upon eruption. This model provides an integrated picture of upper crustal reservoirs and has major implications for the link between shallow plutonic and volcanic rocks.