Strontium behaviour during bioreduction in nitrate impacted sediments

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^{90}Sr is a contaminant at nuclear sites, has a ~30 year half life and has high potential mobility in ground waters. Here, we explored the behaviour of Sr^{2+} during sediment bioreduction under varying pH and NO_3^- amendments. During NO_3^- reduction, enhanced Sr^{2+} sorption to sediments occurred as alkalinity developed as a result of OH^- and HCO_3^- formation during denitrification [1, 2]. During development of metal reducing conditions, Sr^{2+} was then re-released to solution in microcosms with a final pH < 9 suggesting that Sr^{2+} had been preferentially sorbed to Fe(III)-bearing mineral phases during NO_3^- reduction and reductive dissolution of Fe(III)-phases was controlling Sr^{2+} solubility. In microcosms with a final pH > 9, Sr^{2+} was retained on sediments throughout bioreduction presumably to its association with stable carbonate phases which become oversaturated at high pH. Further investigation of these systems with X-ray absorption spectroscopy, electron microscopy and modelling indicated that that at pH < ~9, Sr^{2+} forms outer sphere complexes in the sediment whilst at pH > ~9, incorporation into carbonate phases is possible. Overall, Sr^{2+} behaviour during bioreduction is complex with high pH bioreducing conditions showing potential for co-treating Sr^{2+} with a range of radioactive contaminants.

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Rb-Sr and Sm-Nd isochron ages of the Dongmozhazhua and Mohailaheng Pb-Zn ore deposits in Yushu area, southern Qinghai and their geological implications

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Dongmozhazhua and Mohailaheng Pb-Zn deposits in Yushu area of Qinghai Province are representative Pb-Zn deposits in the Cu-Pb-Zn polymetallic mineralization belt of the northern part of the Nujiang-Lancangjiang-Jinshajiang area, which are in the front belt of Yushu thrust nappe system. The ages of the Dongmozhazhua deposit have been determined by the Rb-Sr isochron method for sphalerite; whereas, the ages of the Mohailaheng deposit have been determined by the Rb-Sr isochron method for sphalerite and the Sm-Nd isochron method for fluorite. The age of Dongmozhazhua deposit is 35.015 ± 0.034 Ma ($(^{87}Sr/^{86}Sr)_0$= 0.7088072 ± 11) for sphalerite. The age of Mohailaheng deposit is 32.22 ± 0.36 Ma ($(^{87}Sr/^{86}Sr)_0$=0.70851380 ± 89) for sphalerite and 31.75 ± 0.28 Ma ($(^{143}Nd/^{144}Nd)_0$= 0.51236150 ± 54) for fluorite with an average of 32 Ma. Combined with geological and geochemical data, it is concluded that the Dongmozhazhua and Mohailaheng deposits formed during the same geological event and the metals have the same source. Together with regional mineralization geological setting, a possible tectonic model for metallogeny of Dongmozhazhua and Mohailaheng Pb-Zn deposits has been established. These two ages are close to the ages of the Pb-Zn deposit in Lanping basin of the southern part of the Nujiang-Lancangjiang-Jinshajiang area and in Tuotuohe basin of the northern part of the Nujiang-Lancangjiang-Jinshajiang area, indicating that it is possible that the narrow 1000 km-length belt controlled by thrust nappe system in the eastern and northern margins of Tibetan plateau would be a giant Pb-Zn mineralization belt.

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