Effects of annealing and HF etching on U-Pb geochronology and Lu-Hf radiogenic isotopes in Sri Lankan zircon crystals

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The aim of this thesis is to study the effects of annealing and HF acid etching on the U-Pb geochronology and Lu-Hf radiogenic isotopes in Sri Lankan zircon crystals. The purpose is to improve our understanding of how zircon crystals that have accumulated significant amounts of radiation damage respond to these treatments. The main objective of this study is to determine if the annealing and HF acid will reduce the amount of discordance and dispersion in the U-Pb age and if the Lu-Hf isotopic systematics will be disturbed. The hypothesis to be tested is that areas of the zircon crystal extensively damaged (i.e., the breakdown of zircon to amorphous SiO₂ and crystalline baddeleyite [ZrO₂]) during the decay of U and Th to Pb will recrystallize during the annealing process forming newly crystallized zircon nanocrystals. By placing the annealed zircon in concentrated HF, the nanocrystals, and any preexisting radiation damaged zircon, will dissolve leaving behind only the undamaged regions of the original zircon crystals. We postulate that the annealing process will not affect the age or Lu-Hf of the zircon in the non-radiation damaged regions of the crystals; the HF etching of the zircon will dissolve these newly formed zircon crystals leaving behind only undamaged regions. When plotted on a Concordia diagram this zircon should give a more precise and accurate age of crystallization with less dispersion and discordance in the data.