***Supporting Information:***



Figure S1- Powder X-ray diffraction patterns for natrozippeite, cobaltzippeite, and zinczippeite. Black trace corresponds to synthetic phase, and green peaks correspond to peak positions and heights calculated from the structural model (Burns *et al.*, 2003)

Table S1. ICP-OES results for chemical analysis of synthetic Na-, Co-, and Zn-zippeite.

|  |  |  |  |
| --- | --- | --- | --- |
| *Sample* | *Ratio* | *Ideal* | *Actual* |
| Natrozippeite | mol Na/mol U | 0.63 | 0.63±0.01 |
| mol S/mol U | 0.5 | 0.48±0.03 |
| Cobaltzippeite | mol Co/mol U | 0.5 | 0.5±0.02 |
| mol S/mol U | 0.5 | 0.48±0.03 |
| Zinczippeite | mol Zn/mol U | 0.5 | 0.53±0.02 |
| mol S/mol U | 0.5 | 0.47±0.03 |