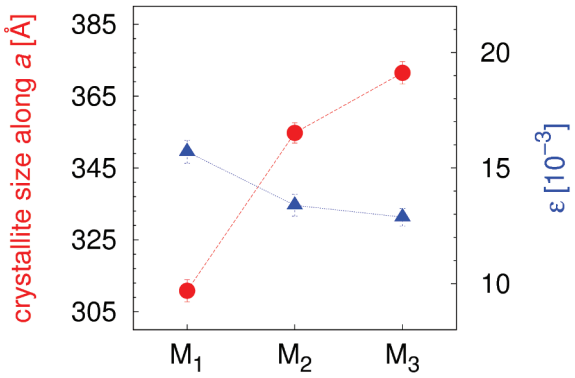

Figure 1. Crystallite size along *a* axis (red circles, left ordinate) and micro-strain (blue triangles, right ordinate) of various molar types. Crystallite size along the direction of c axis shows analogues behavior.

Keywords: crystallite size, micro-strain, enamel development

MS14-P11 High-temperature, high-pressure hydrothermal synthesis of uranium silicates and germanates

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Most uranium minerals can be classified as oxidized species in which U is fully oxidized to U^{6+}, and reduced species, in which U occurs primarily as U^{4+}. Uranyl silicates are an important group of U(VI) minerals in the altered zones of many uranium deposits.[1] One naturally occurring U(IV) silicate exists, namely coffinite ($USiO_4$), which is an important ore mineral for uranium. Numerous synthetic U(VI) silicates and germanates containing organic amines or alkali metals as countercations have also been reported.[2] In contrast to the U(VI) compounds, the chemistry of materials containing U(V) is considerably less developed owing to the tendency of U^{5+} to either oxidize to U^{6+} or disproportionate to U^{4+} and U^{6+}. We have synthesized a U(V) silicate and a germanate by a high-T, high-P hydrothermal method in gold ampoules contained in a high-pressure reaction vessel at ca. 600 ºC and 170 MPa.[3a,3b] Following the synthesis of the U(V) compound, a number of mixed-valence uranium silicates and germanates have been synthesized, for example, a mixed-valence U(IV,V) silicate, $Cs_2K(UO)_2Si_4O_{12}$,[3c] U(IV,VI) germanate, $Cs_8U(UO_2)_3(Ge_3O_9)_3{\cdot}3H_2O$,[3d] U(V,VI) germanates, $A_3(U_2O_4)Ge_2O_7$ (A = Rb, Cs),[3e] and a U(IV,V,VI) silicate, $Na_7U^{IV}O_2(U^{V}O)_2(U^{V/VI}O_2)_2Si_4O_{16}$,[3f] in which three oxidation states of uranium co-exist in one compound. In addition, tetravalent-uranium compounds, $Cs_2USi_6O_{15}$ and $Cs_4UGe_8O_{20}$,[3g,3h] were also synthesized. All members in the family of uranium silicates and germanates with the oxidation states of uranium from +4 to +6 have been observed.

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