Supplementary Material (ESI) for Chemical Communications
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Unprecedented Synthesis of Piezoelectric Langasite Nanorods

Zoe Schnepp, John Mitchells, Stephen Mann and Simon R. Hall

Supplementary Information

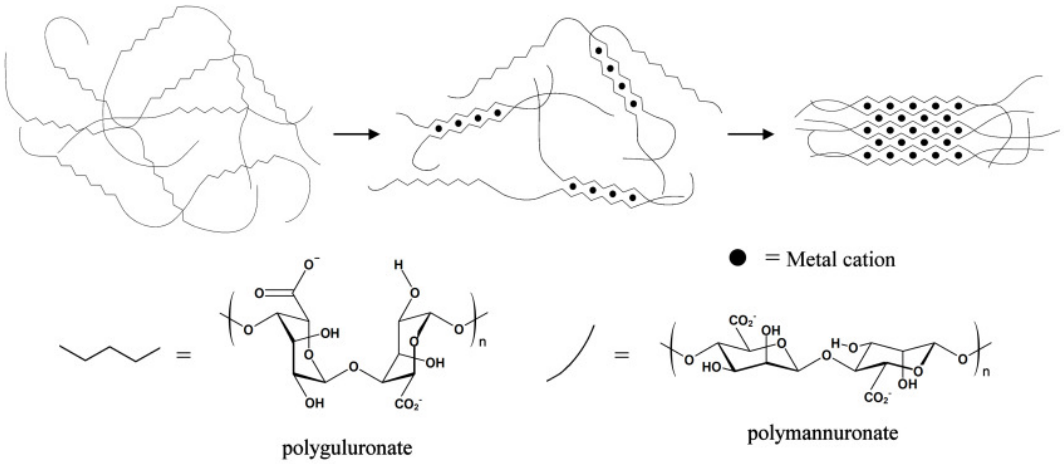

Figure S1 The egg-box model of cation binding in the alginate biopolymer.

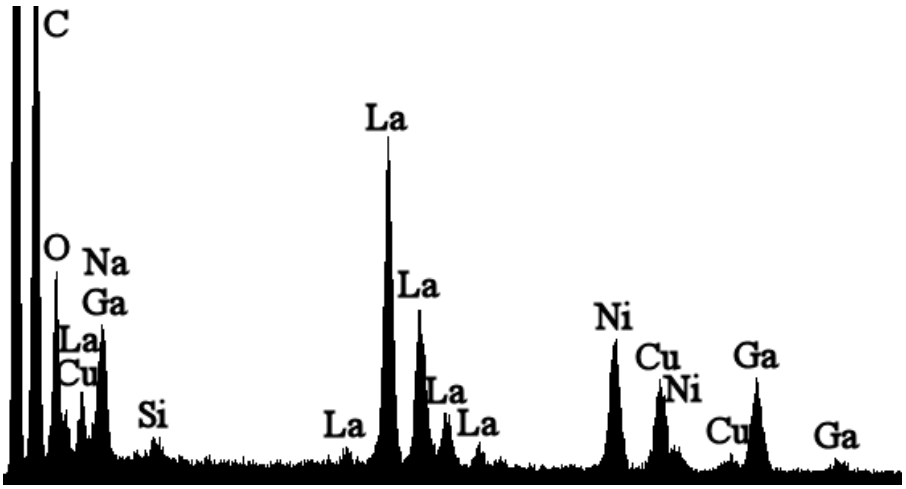

Figure S2 EDXA for a single nanorod of langasite, showing peaks for lanthanum, gallium and silicon.

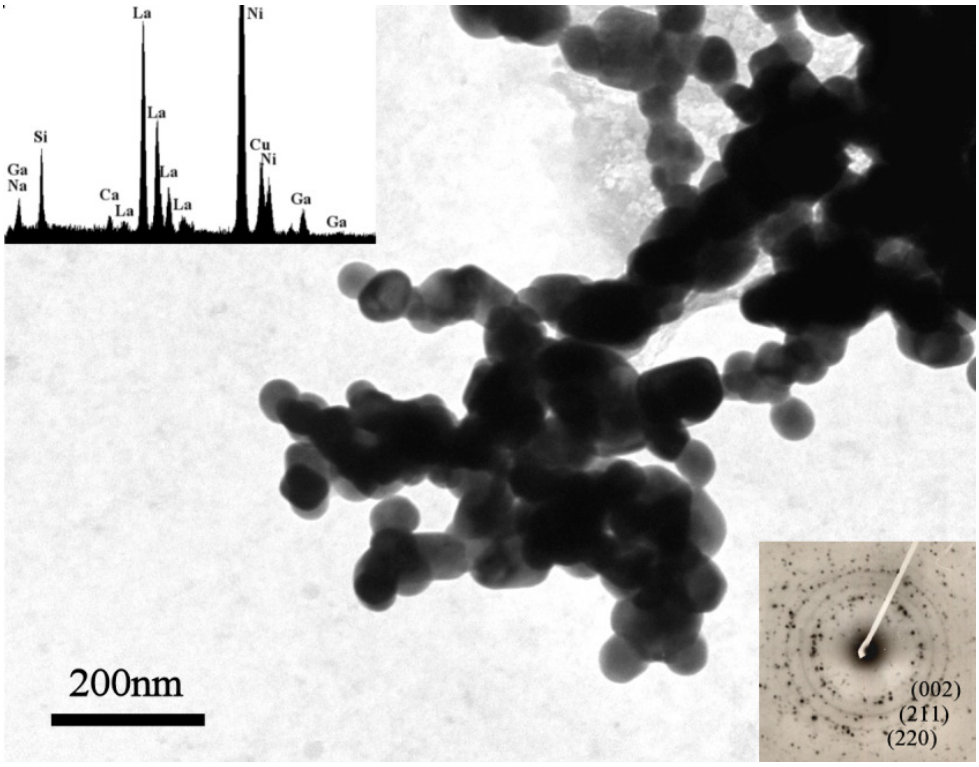

Figure S3 TEM image with corresponding EDXA and SAED ring pattern showing the nature of the $La_{9.33}Si_6O_{26}$ phase.

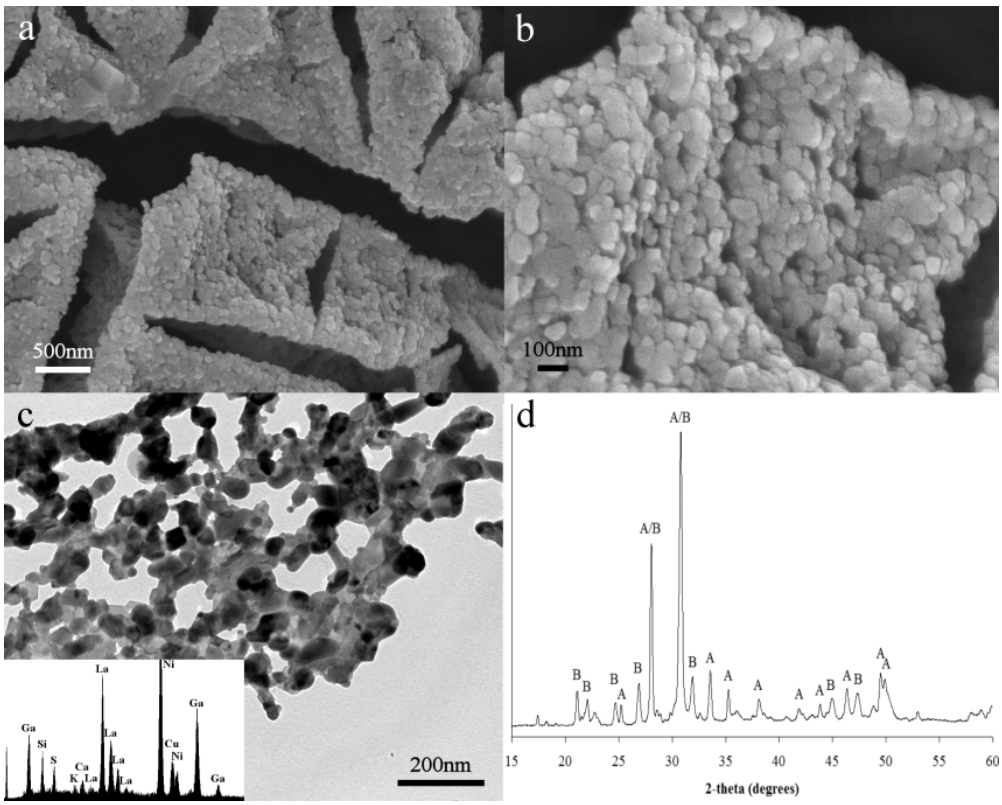

Figure S4 SEM (a,b), TEM with corresponding EDXA (c) and PXRD pattern (d) for a sample synthesized from agar. The PXRD pattern shows peaks for $La_3Ga_5SiO_{14}$ (A) and $La_{9.33}Si_6O_{26}$ (B).

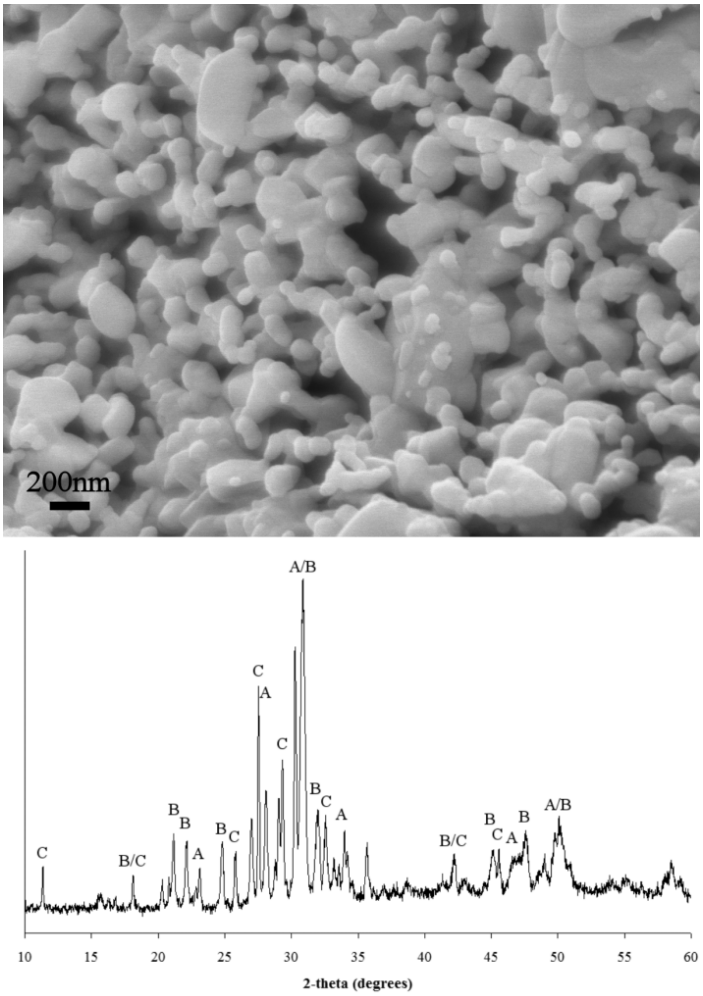

Figure S5 SEM image and PXRD pattern for a sample synthesized from ammonium alginate, showing peaks for $La_3Ga_5SiO_{14}$ (A), $La_{9.33}Si_6O_{26}$ (B) and $La_4Ga_2O_9$ (C).

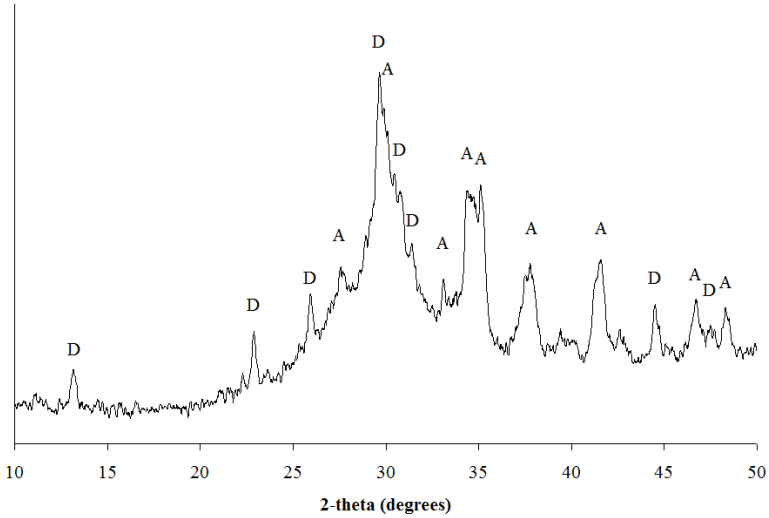

Figure S6 An XRD pattern of a sample quenched at 500 °C during calcination from sodium alginate, showing peaks for (A) Na_2CO_3 and (D) $La_2O_2CO_3$. Similar peaks for Na_2CO_3 were observed for samples at 600 °C, 700 °C and 800 °C.

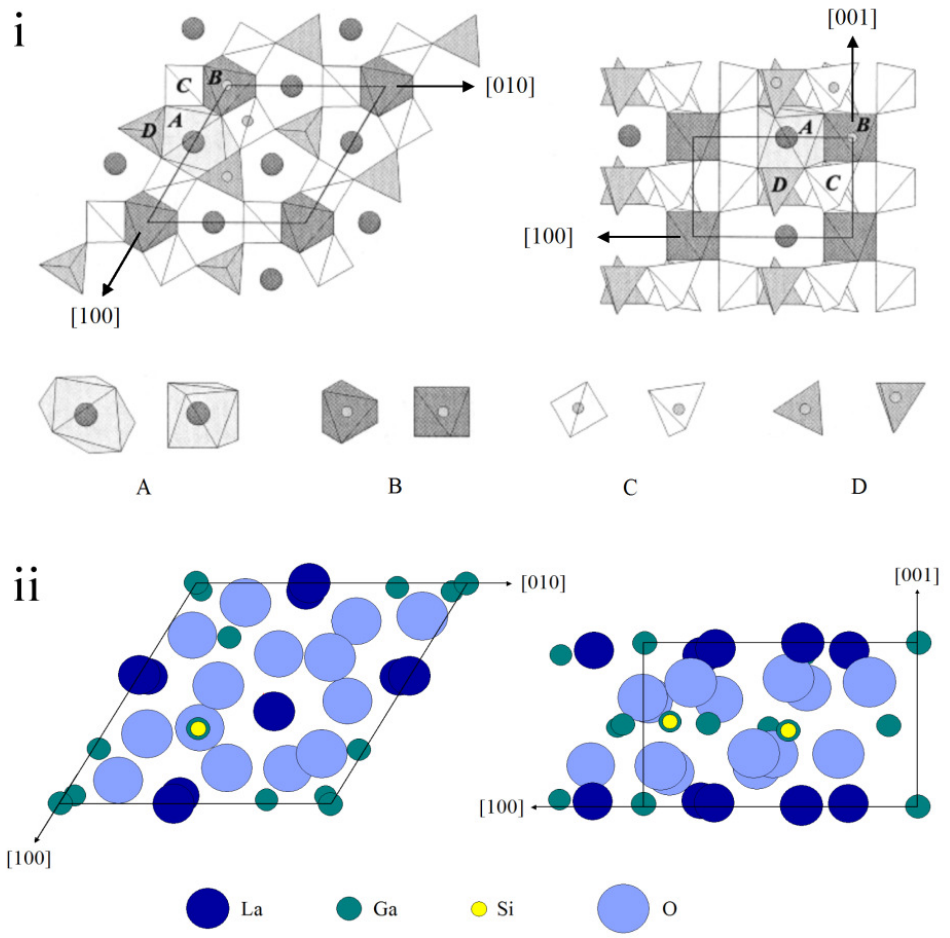

Figure S7 The crystal structure (i) of the langasite mineral family based on the formula $A_3BC_3D_2O_{14}$, showing the decahedral A sites, octahedral B sites and tetrahedral C and D sites (figure adapted from Iwataki *et al.*, *J. Eur. Ceram. Soc.* (2001) 21, 1409-1412) showing a view of the unit cell down the *c*-axis (left) and also a view down the [120] direction (right). GaO_4 and SiO_4 tetrahedra form layers perpendicular to the *c*-axis that are connected by octahedral GaO_6 and decahedral LaO_8 ions. Also shown is the arrangement of atoms in the unit cell of langasite (ii) showing a view of the unit cell down the *c*-axis (left) and down the [120] direction (right).

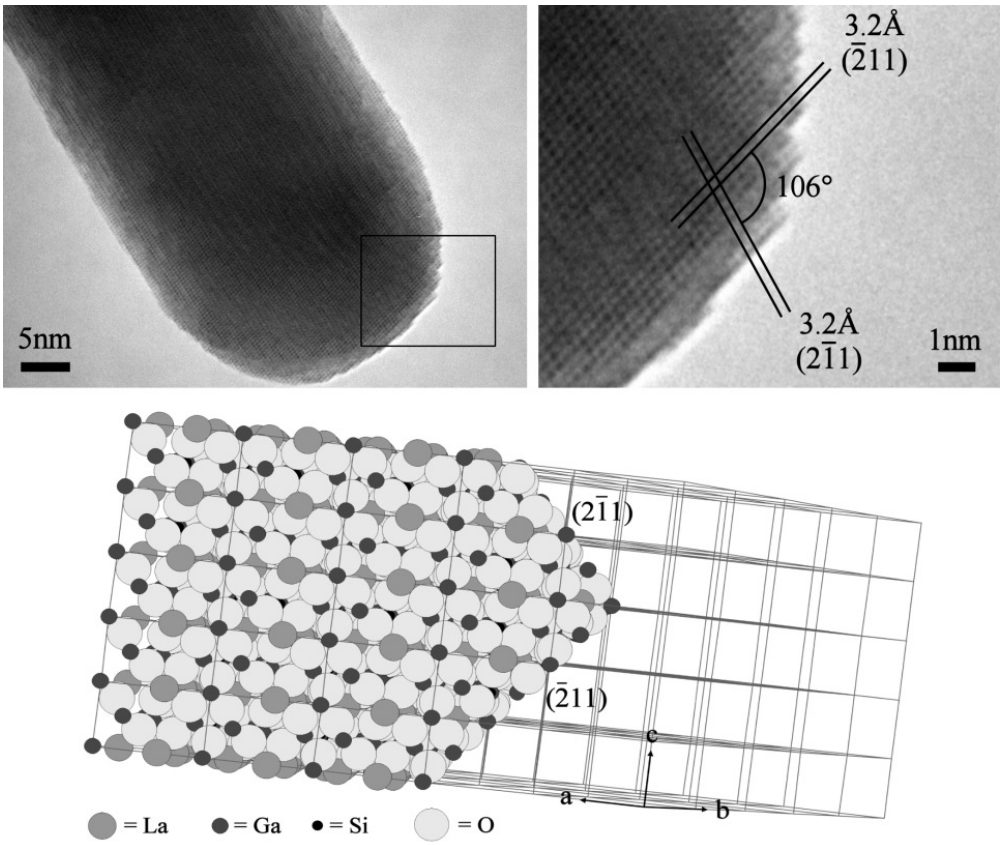

Figure S8 An example of a needle with two sets of planes, assigned (2̄11) and (21̄1), at 106°(74°), which corresponds to a zone axis of <120>. A model of the langasite crystal in this zone axis is also shown with the structure cut away along the (2̄11) and (21̄1) planes, corresponding to the 'stepped' surface observed in the crystal.

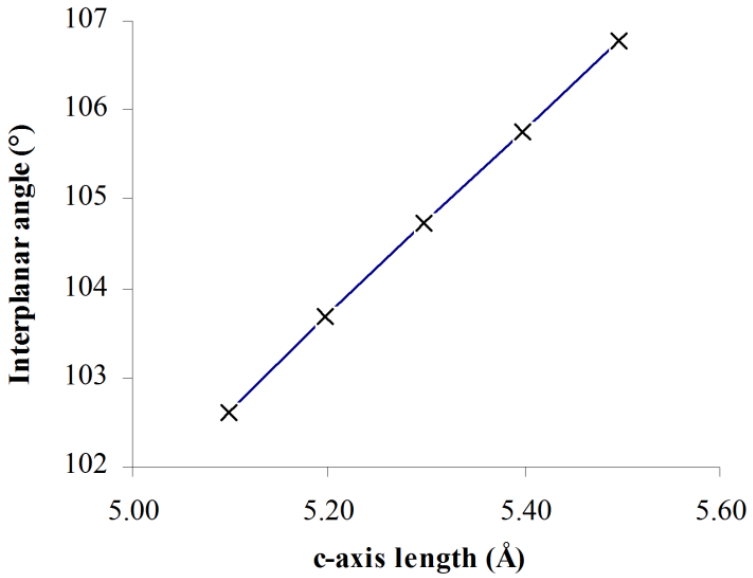

Figure S9 The variation of the interplanar angle with increasing *c*-axis length for the set of planes detailed in figure S8.