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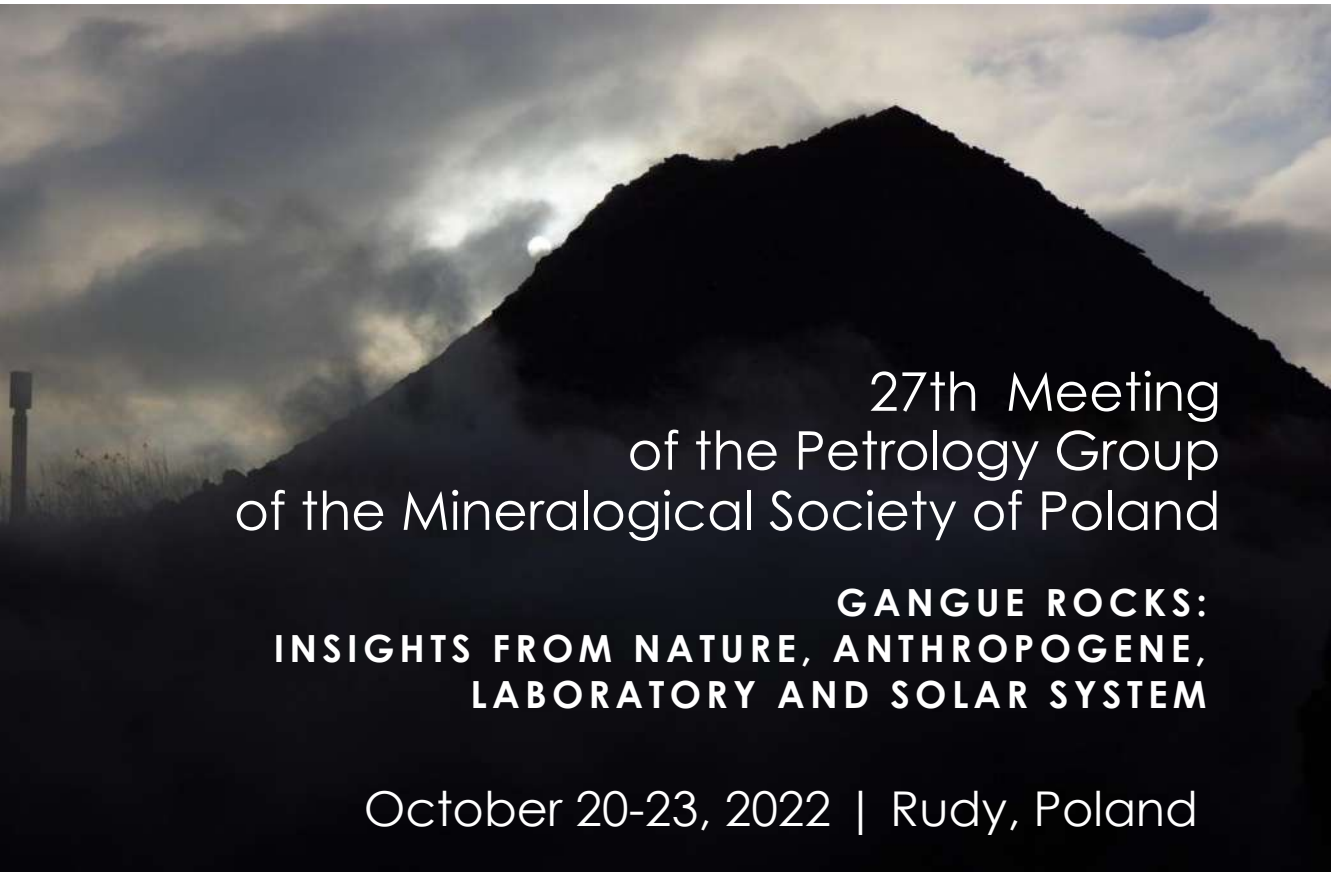
Abstracts and field trip guide



27th Meeting of the Petrology Group of the Mineralogical Society of Poland

GANGUE ROCKS: INSIGHTS FROM NATURE, ANTHROPOGENE, LABORATORY AND SOLAR SYSTEM

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A revised crystal structure for the rare earth fluoride gagarinite-(Ce) from experimental synthesis by fluid-induced alteration of chevkinite-(Ce)

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The Rare Earth Element (REE) fluoride, gagarinite-(Ce), $^{A}Na^{B}(REE,Ca)_2F_6$ has been synthesized in an experiment designed to examine the fluid-induced alteration of chevkinite-(Ce). The experiments were conducted at 600°C and 400 MPa for 21 days, 550°C and 200 MPa for 63 days and 600°C and 200 MPa for 42 days. The formula of crystallized gagarinite-(Ce) analogue is $(Na_{1.10}Ce_{0.69}Ca_{0.44}Nd_{0.31}La_{0.26}Pr_{0.12}Sm_{0.04}Sr_{0.03})_{3.0}F_{6.0}$.

The mineral, previously named zajacite-(Ce), is known from only one natural occurrence, a hypersolvus granite from the Strange Lake Zr-Y-REE-Nb-Be deposit, Quebec-Labrador. The space group was identified as $P\bar{3}$ (Jambor et al. 1996) and later $P6_3/m$ (Sciberras et al. 2011).

The gagarinite-(Ce) in our experiments crystallized in $P\bar{6}$, with a = 6.1465(2), c = 3.75950(10), R_1=1.37%. We observed 26% twinning by a twin centre.

Previous studies assumed full occupancy of the *A* site. To charge balance the substitution $2^{A}REE^{3+} \rightarrow {}^{A}Ca^{2+} + {}^{A}REE^{3+} + {}^{B}Na^{+}$, the amount of extra Na^+ must equal Ca^{2+} in the final formula, giving $Na_x(Ca_xREE_{2-x})F_6$. Gagarinite-(Ce) from the experiment shows surplus Na over Ca with a ratio close to 2:1. A vacancy in the REE site is necessary, equal to 1/3 of the redundant Na to remain in charge balance. If the Na content exceeds 1 in the formula unit, Na has to substitute for REE in the cation site. Thus, the overall substitution mechanism is:

$(2x-y)REE^{3+} \rightarrow y\ {}^{B}Na^{+} + (x-y)\ {}^{A}Na^{+} + y\ {}^{A}Ca^{2+} + (x-y)/3\ {}^{A}\square$, where □ stands for vacancy and x > y.

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References

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