

XRD analysis of MAX phase - PANalytical X'Pert Pro

Date: 2019-10-16

Tags: Training XRD XRD5 KU Leuven 07/10/2019Synth

Created by: James Bird

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Goal : Characterise parent Ti_3AlC_2 MAX phase used in Ti_3C_2 MXene synthesis (see Exp. 'MXene Synthesis III')

Procedure :

Sample preparation

Ground Ti_3AlC_2 MAX phase (KU Leuven, $d < 38 \mu\text{m}$, see Exp. 'Sieving of mortar-ground MAX Phase') loaded into back-loading powder sample holder, ensuring powder flush with holder surface.

Instrument set-up

Geometry	Bragg-Brentano
Spinner	PW3064
Detector	1D X'Celerator (2.122 ° active length)
X-ray source	Copper line focus
Radiation	$K_{\alpha 1} = 0.1540598 \text{ nm}$, $K_{\alpha 2} = 0.1544426 \text{ nm}$, K_{α} ratio 0.5, $K_{\alpha \text{ av}} = 0.1541874 \text{ nm}$
K_{α} absorber	0.02 mm Ni
Incident beam optics	0.04 rad Soller, 2 ° fixed anti-scatter, 10 mm incident beam mask, fixed divergence slit (0.25°, 140 mm from sample giving 8 mm irradiated length)
Diffacted beam optics	0.04 rad Soller
2θ start:finish:step / °	5:70:8.4x10 ⁻³
Dwell time / s	2.86
Stage oscillation (°)	Yes

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Results :

Sample	Filename prefix
Ti ₃ AlC ₂ MAX phase (KU Leuven, $d < 38 \mu\text{m}$)	James Bird 10mm Mask Refinement_Ti3AlC2 _38 micron_20191016 (2)

.xy file is xy data of 2θ vs intensity, .xrdml file is raw output from diffractometer and .png is an image of the plotted data.

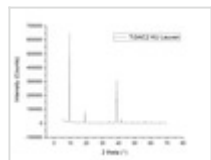
Conclusions:

Quick analysis in X'Pert HighScore software indicates >98 % purity for the Ti₃AlC₂ MAX phase (correlating with PDF 04-012-0632). The dominant impurity seems to be alumina (syn, Corundum, Al₂O₃, PDF 00-046-1212), although two reflections remain unassigned at 2θ values of 8.61 and 35.95 °.

Attached files

Ti3AlC2_KULeuven.png

sha256: e48c4c99efe3d5735f01201e507e60b48e95cf6a9ae9b122474a0c83c167e558



James-Bird-10mm-Mask-Refinement_Ti3AlC2-_38-micron_20191016-2.xrdml

sha256: 0e62f591f66745e6077bc8fd94a7a57f6d042081581e78b1d29c154af3e534c7

Ti3AlC2-KU-Leuven-D-Lunt-powder-38um.xy

sha256: 5809c799539861bf9346237c7b62a029fccbbd2d92981ca2aedcba7345ae0cb4

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