LATE-STAGE MELT MIGRATION IN THE SKAERGAARD INTRUSION

VICTORIA C. HONOUR, MARIAN B. HOLNESS, GAUTIER NICOLI, SAM WEATHERLEY, BRENDAN DYCK, JENS ANDERSEN
SILICATE LIQUID IMMISCIBILITY

Introduction

Results

Discussion

Conclusion

- Fe-rich glass
- Si-rich glass

- CaO+MgO+FeO+TiO₂+P₂O₅
- SiO₂+Na₂O+K₂O+Al₂O₃
- How does mush thickness control the morphology of accumulated late-stage liquids?
- Was there silicate liquid immiscibility in late-stage liquids?
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- Was there silicate liquid immiscibility in late-stage liquids?
LATE-STAGE LIQUIDS

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CONSTRaining THE MUSH THICKNESS

Re-drawn from Nielsen 2004

Holness et al 2017
UZA TROUGH LAYERING: AN INCREASE IN MUSH THICKNESS

Drone photography by J. Andersen
TROUGH LAYERING: THICKENING THE MUSH

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MORPHOLOGY OF THE LATE-STAGE LIQUIDS

UZc gabbro (thin mush)

Gabbroic pegmatite sill (often referred to as melanogranophyre)
- How does mush thickness control the morphology of accumulated late-stage liquids?

- Was there silicate liquid immiscibility in late-stage liquids?

Geological map by McBirney (1989)
SEGREGATED LIQUIDS ASSOCIATED WITH THE PEGMATITIDES

Gabbroic pegmatite

Average gabbro

OL pyroxenite

LZc gabbro

Felsic segregations

Mafic segregations
SEGREGATED LIQUIDS: WHAT DO THEY LOOK LIKE?

Mafic segregations

Felsic segregations

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CHANGES TO THE MAFIC SEGREGATION COMPOSITION

Olivine pyroxenite with a little oxide (LZa) → Increasing oxide percentage → Magnetite-rich (MZ)

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CHANGES TO THE MAFIC SEGREGATION COMPOSITION

Olivine pyroxenite with a little oxide (LZa)

Increasing oxide percentage

Magnetite-rich (MZ)

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FeOt+MnO+TiO2+CaO+P2O5 0 100

- Philpotts 1982 NS
- Helz 1987 NS
- Honour et al (in review) Exp
- Charlier & Grove 2012 Exp
- Veksler 2008 Exp
- Philpotts 1981 MI
- Krasov & Clocchiatti 1979 MI
- Ryabov 1989 MI

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Mafic segregations

Felsic segregations
TRACE ELEMENT PARTITIONING IN THE SEGREGATED LIQUIDS


data points for liquid-liquid partition coefficients for 1050°C LFe/Lsi in Fe-rich and Si-rich immiscible liquids.

Veksler et al. 2006

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Fe-rich immiscible liquid

Si-rich immiscible liquid

Liquid-liquid partition coefficients for 1050°C LFe/Lsi

Veksler et al. 2006

Trace element (ordered by ionic charge)
TRACE ELEMENT PARTITIONING IN THE SEGREGATED LIQUIDS

- Fe-rich immiscible segregation
- Si-rich immiscible segregation
- Gabbroic segregation

**Results**

- Zn (ppm) vs. FeO wt %
- Ce (ppm) vs. FeO wt %

**Discussion**

- Average gabbro
TRACE ELEMENT PARTITIONING IN THE SEGREGATED LIQUIDS

TRACE ELEMENT PARTITIONING IN THE SEGREGATED LIQUIDS

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- The gabbroic pegmatite morphology is a result of the mush rheology and thickness.

- The mafic and felsic segregations are immiscible conjugates associated with the gabbroic pegmatites.

- The composition of the conjugate liquid segregations evolves upwards through the stratigraphy.