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INSTITUT FÜR
KERAMIK, GLAS- UND BAUSTOFFTECHNIK



Investigations in the system $\text{MgO}-\text{Al}_2\text{O}_3-\text{TiO}_2$

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Motivation of the investigation

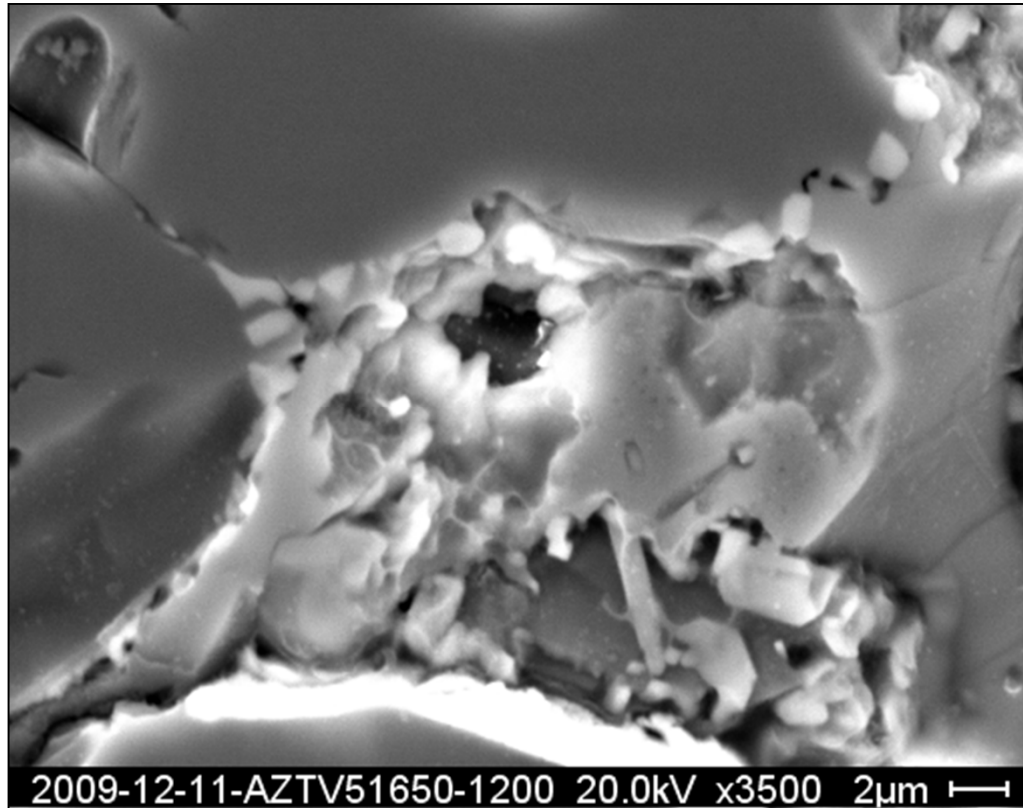
previous works_[1] shows:

- material system: Al_2TiO_5 in Al_2O_3 -matrix
- attempt: thermal shock at 1200 °C
- result: increased residual strength
- cause: decomposition Al_2TiO_5 in alumina and rutile
- proof: rutile at grain boundaries of Al_2O_3 grains

[1] C. G. Aneziris, S. Dudczig, N. Gerlach, H. Berek, D. Veres, Thermal Shock Performance of Fine Grained Al_2O_3 ceramics with TiO_2 and ZrO_2 additions for Refractory Applications, Advanced Engineering Materials, Volume 12, Issue 6, (2010), 478–485



Motivation of the investigation

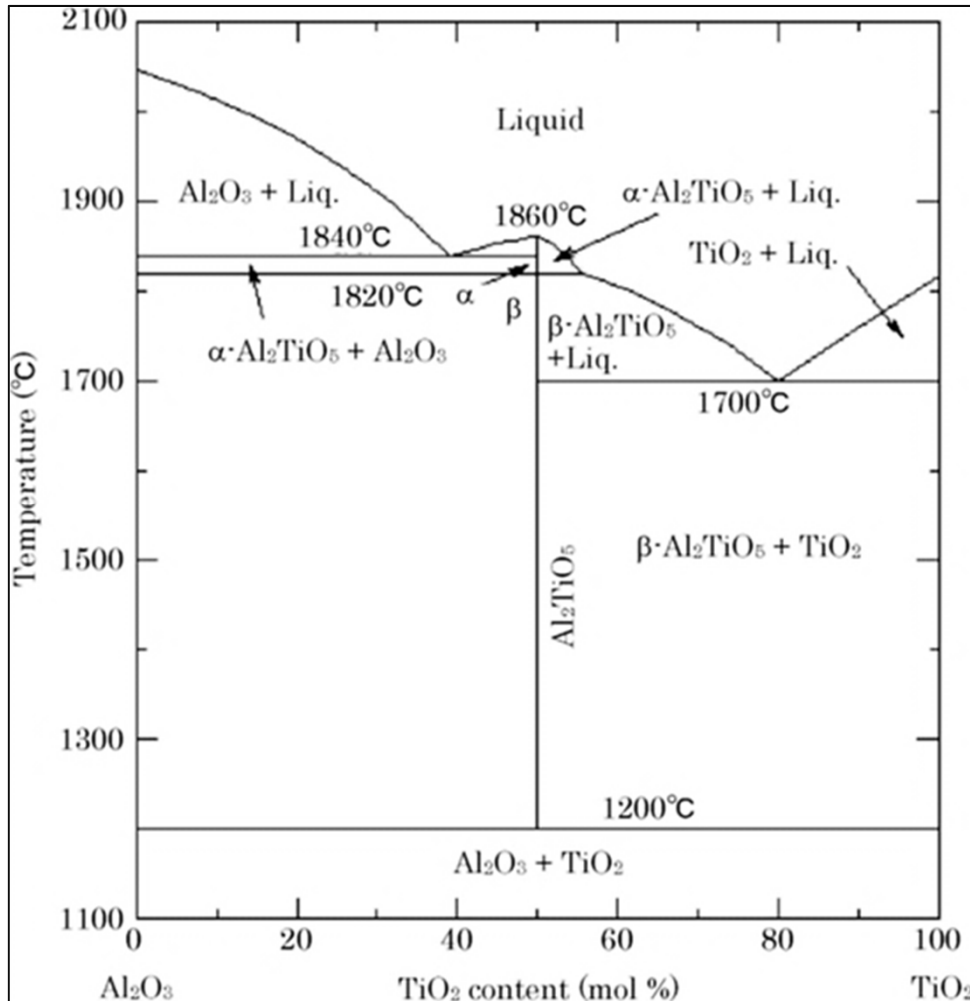


picture reference [1]

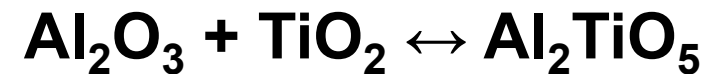
decomposition of $\text{Al}_2\text{TiO}_5 \rightarrow$ increased strength after thermal shock

→ transfer to other system with spinel-matrix

synthesis and decomposition of Al_2TiO_5



picture reference [2]



temperature regime of synthesis:

1650 °C of 4 h dwell time and free cooling

temperature regime of complete decomposition:

1150 °C of 12 h dwell time and free cooling



spinel + Al_2TiO_5

Investigation of thermal shock resistance

- Thermal shock at 950 and 1150 °C
- samples shocked once and five times
- results:
 - spinel slightest thermal shock resistance
 - samples with 2 and 6 weight-% Al_2TiO_5 comparable thermal shock resistance
 - **samples with 12 weight-% Al_2TiO_5 best thermal shock resistance**



abstract

- improvement of thermal shock resistance by Al_2TiO_5 in spinel is possible
→ strength declension limited to 12,9 % with 12 weight-% Al_2TiO_5
- improved strength by 2 and 6 weight-% Al_2TiO_5
- samples with in situ formation of Al_2TiO_5 had a positively effect



Thank you for your attention !



references

- [1] C. G. Aneziris, S. Dudczig, N. Gerlach, H. Berek, D. Veres, Thermal Shock Performance of Fine Grained Al_2O_3 ceramics with TiO_2 and ZrO_2 additions for Refractory Applications, *Advanced Engineering Materials*, Volume 12, Issue 6, (2010), 478–485
- [2] H. Unno, Y. Sato, S. Toh, N. Yoshinaga, S. Matsumura, Microstructures and electrical properties of TiO_2 -doped Al_2O_3 ceramics, *Journal of Electron Microscopy*, Volume 59, Issue S1, (2009), 107-115

