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Dilatometer Investigations of Reactive Sintering of Zinc Titana[illegible]eramics

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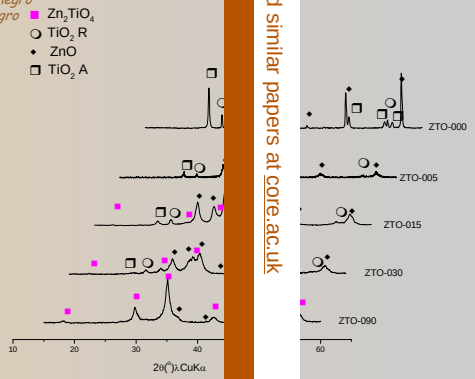
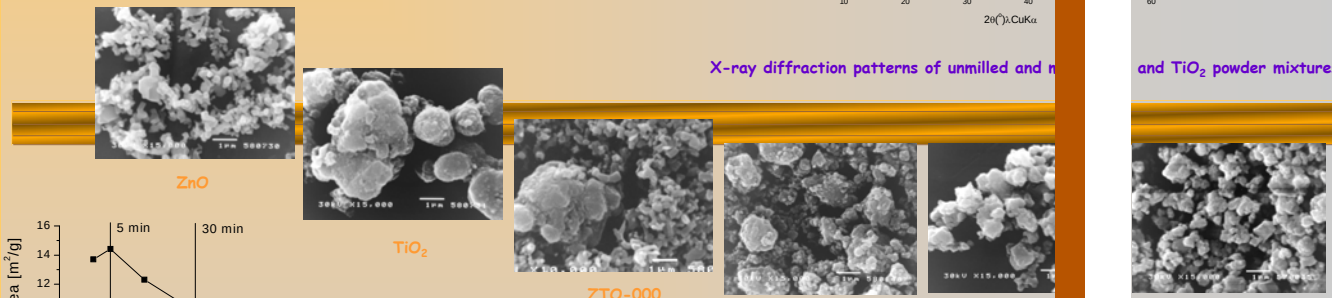
Abstract

Starting powder mixtures of ZnO and TiO_2, in the molar ratio that is in accordance with stoichiometry of zinc titanate Zn_2TiO_4, were mechanically activated using planetary ball mill during different time intervals from 0 to 90 minutes. X-ray diffraction analysis, scanning electron microscopy and non-isothermal dilatometric measurements were performed in order to investigate zinc titanates formation. Processes that occur during mechanical activation lead to the formation of a specific structure of obtained powders that promoted and accelerated solid-state reactions and densification during reaction sintering.

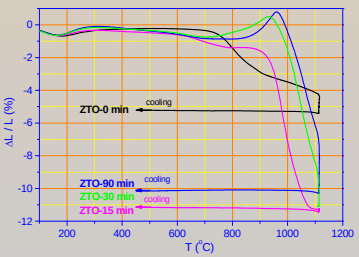


X-ray diffraction patterns of unmilled and m[illegible] and TiO_2 powder mixtures

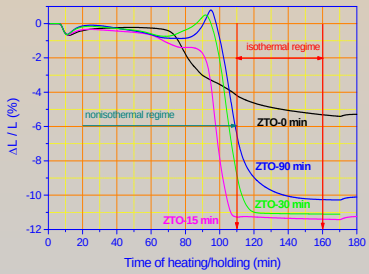


Scanning electron micrographs of starting ZnO, TiO_2, non-activated a[illegible]rious activated powders

The dependence of SSA vs. time of milling



Relative shrinkage of the non-activated and various activated samples as a function of temperature during heating to 1100°C with heating rate of 10°C/min and 2 hours holding



Relative shrinkage of the non-activated and various activated samples as a function of time during heating to 1100°C with heating rate of 10°C/min and 2 hours holding

Conclusions

The influences of mecha[illegible]tivation on solid-state reaction and sinte[illegible]a mixture 2ZnO-TiO_2 were investigated. [illegible]he results of the present research it is [illegible] to conclude that mechanical activation end[illegible]ter compaction of activated powders withou[illegible]s, but first of all that Zn_2TiO_4 ceramics [illegible] be obtained by mechanical activation c[illegible]ertain time with appropriate thermal trea[illegible]i.e. heating rate and sintering time, at t[illegible]ure lower then in case where no activated [illegible] were used.

The main conclusion base[illegible]tometry and XRD analysis is that activatio[illegible]y 15 minutes very successfully promotes s[illegible]te reactions and sintering processes and[illegible]ishes an optimal thermal treatment of s[illegible]at a significantly lower temperature than[illegible]e case of non-activated mixture.

Acknowledgement

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