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## Nomenclature

Symbol	Meaning
CMRDI	Central Metallurgical Research and Development Institute
SHS	Self-propagating high-temperature synthesis
FGH	Functional grade materials
$T_{ad}$	Adiabatic combustion temperature
$\Delta H_r$	Reaction enthalpy
$\Delta H_f$	Enthalpy of formation
$T_o$	Starting temperature
$C_p$	Heat capacity
$T_m$	Melting temperature
$\Delta H_m$	Enthalpy of fusion
$v$	Fraction of the reaction product which under went melting
$T_{ig}$	Ignition temperature
$T_{start}$	Initial temperature
$\phi$	Kinetic function
$\eta$	Fraction reacted
$\rho$	Product density
$k$	Thermal conductivity
$x$	Axial distance
$Q$	Heat generated
$k_o$	Pre-exponential constant
$R$	Universal gas constant
$n$	Order of the reaction
$u$	Velocity of the combustion front
$a$	Thermal diffusivity
$E$	Activation energy
$\phi$	Heat released
$\eta$	Degree of conversion
$\tau$	Temperature rise
$\tau_{ad}$	Maximum temperature rise under adiabatic condition
$t_r$	Rise time
$t_d$	Decay time
DARPA	Defence Advanced Research Projects Agency

HPCS	Digh pressure combustion sintering
HIP	Hot isostatic pressing
AZ91D	Squeeze cast magnesium alloy
QIP	Quasi-isostatic pressing
OP	Open pores
ISO	Closed pores
DTA	Differential thermal analysis
MH	Microwave heating
MHH	Microwave hybrid heating
XRD	X-ray diffraction
TGA	Thermal gravity analyzer
AC	Power source
V	Voltage
u	Wave velocity
r	Distance
$\lambda$	Wave length
$w_1$	Weight of the dry specimen in air
$w_2$	Weight of the specimen in water
$w_c$	Weight of the cage in water
$w_3$	Weight of the specimen in air
$d_w$	Density of water
$T_c$	Combustion temperature
$T_o$	Onset temperature
EDS	Energy dispersive spectroscopy
CVD	Chemical vapor deposition
PVD	Physical vapor deposition

# AIM OF WORK

## AIM OF WORK

The current thesis is a continuation of the research activities in the Central Metallurgical Research and Development Institute (CMRDI), which aims to synthesis of titanium carbide/aluminum oxide composites.

### **The objectives of this thesis are:**

- Synthesis of TiC/Al<sub>2</sub>O<sub>3</sub> composites powder by self-propagating high-temperature synthesis (SHS).
- Studying the dependence of microstructure, composition and density of products, as well as combustion temperature and the wave velocity, on the Al grain size, Al content and initial temperature of the reaction.
- Studying the thermodynamics and kinetics of the different reactions occurring during the combustion process and calculating the adiabatic temperature and the activation energy of the combustion reactions using the wave velocity measurements method.