Table S1. Self-propagating high-temperature synthesis protocols of some MAX phases in chronological order

N	Aim of the work	Initial mixture	Process and sample parameters after SHS	Products	Reference	Comment
1	V2AlC by SHS metallothermy	26.6V2O5/28.2Mg/4.5 Al/0.7C/40NaCl, 3 MPa Ar, dry mixing, 60rpm, 2h	-	V2AlC (95%), VAl, VC with 20 mm mean particle size (after acid leaching MgO and MgAl2O4 were removed)	Vershinnikov 2023 [79]	The minimum VC content was observed at 60% C deficiency, 60% Al excess.
2	Al-Ti-C porous structures by magnetic field-assisted SHS	Ti:Al:C=2:1:1, SHS in magnetic field	Tc=1500-1600oC	TiAl, TiC, Ti2AlC and Ti3AlC2	Dmitruk 2022 [31]	Ball milling was done to activate powders for producing porous structures
3	SHS aluminothermy of Mo3Al2C	Mixture of MoO3 + Al + C + Al2O3 combusted in 5 MPa Ar pressure	-	Mo3Al2C, Mo-Al and Mo-C as byproducts	Kovalev 2022 [81]	The largest percentage of Mo3Al2C in the ingot was reached at 20% Al2O3 addition.
4	Ti2AlNx	Hydride cycle was used for the synthesis of Ti2AlNx MAX phase from titanium hydridonitride or Ti2Al intermetallic compound.			Aleksanyan 2022 [56]	Hydride cycle includes the synthesis of III-V transition metal hydrides by SHS, cold isostatic pressing and dehydrogenation-sintering in vacuum at 900–1150oC.
5	SHS of Ti3(Al,Si)C2 composite	Hot pressing of SHS derived Ti3AlC2 and Ti3SiC2 powders, duration 1 h, T=1300oC, 25MPa	-	$Ti_3Al_{(1-x)}Si_xC_2$ (x = 0 to x = 1) MAX-phase with 10% TiC, at x=0, TiC was 12.5% when x=1, up	Goc2021 [88]	During hot pressing process, the TiC and TiSi2 impurities present in powders convert into MAX phase.

		pressure		to 27%TiC and 11%TiSi2 were present		
6	Preparation of (Cr, Mn, V)– Al–C MAX phases by SHS metallothermy	chromium (III) oxide, manganese (IV) oxide, vanadium (V) oxide, calcium (IV) oxide, aluminum, and carbon, SHS in 5MPa Ar pressure	1.Cr-Al-C, Uc=0.6 cm/s 2.Cr-Mn-Al-C, Uc=0.83 cm/s 3.V-Al-C, Uc=4.5 cm/s	1.Cr2AlC, Cr5Al8, Cr7C3, Cr3C2 2. (CrxMn1–x)2AlC solid solution, Mn3AlC, and Cr2Al. 3. V2AlC and traces of VCx and VAl3.	Gorshkov2021 [71]	CaO2+Al exothermic mixture was used to intensify SHS (Tad>4000K). Slag contained CaO-Al2O3 mixture.
7	Preparation of (V,Cr)2AlC solid solution	vanadium(V) and chromium(III) oxides with aluminum and carbon (graphite).	RT resistance was 1.14 μΩ m, which is higher than that of V2AlC and Cr2AlC	The product also contains vanadium and chromium carbides and intermetallics.	Sychev 2021 [72]	Nonequilibrium character of the synthesis process due to a short “lifetime” of melt and its fast cooling and crystallization result in impurities.
8	SHS in Cr-Ti-Al-C system	70% (Cr2O3 + 3Al + C)/(2Ti + Al + C) + 30% (3CaO2 + 2Al) mixture, 5 MPa Ar pressure	-	(Cr1 – xTix)2AlC (x = 0.18–0.28) phase of 43-62%, along with Ti0.9Cr0.1C, Cr7C3, Cr3C2 and intermetallics (Al8Cr5, AlTi3)	Gorshkov 2021 [73]	Impurities are associated by the insufficient lifetime of the melt formed in the combustion wave.
9	SHS of Ti2AlC and Ti3AlC2 MAX phases	Ball milling for 2h, then SHS in boat at 4MPa Ar pressure of TiO2, Mg, C mixture		Ti2AlC, MgAl2O4, and TiC at Mg deficiency, 20-30%Mg excess lead to Ti2AlC and TiC, target product	Vershinnikov 2020 [64]	MgO removed HCl at 70oC. Increasing soot, lead to Ti3AlC2, Ti2AlC and TiC, while low soot decreases TiC, yield 35-40% after MgOremoval

				about 93%		
10	The influence of precursor on SHS of Cr2AlC	CaCrO4 + Al + C mixture at 5 MPa Ar pressure	Uc=11-7.5 mm/s vs low and high carbon content	Cr2AlC (67vol%), also contained Cr7C3 and Cr5Al	Gorshkov2020 [74]	CaCrO4 was better than CrO3, which is hygroscopic and thermally unstable.
11	SHS of Ti-Si-C and Nb-Al-C systems	Mixtures of powders of Ti, Si, Nb, Al, and C, pressed to porous compact (40-45% density) of 20x32 mm in size, SHS in Ar atmosphere	Tc= 2373 ± 25 K for Ti-Si-C mixture	Ti3SiC2 (with 12-18vol%TiC), Nb2AlC with NbC and Nb4AlC3	Afanasyev2020 [39]	Annealing at 1400oC or sintering at 1200oC for 4 h in vacuum increases Ti3SiC2 content up to 98vol%
12	SHS of V2AlC MAX phase	vanadium oxide(V) and (IV) powders with aluminum and carbon (graphite). 5 MPa Ar pressure	grain size of the V2AlC phase was 8-10 μm and a layer thickness – 40-70 nm	V2AlC (65wt%) with VCx, V2C, VAl, VAl3 phases.	Gorshkov2020 [80]	V2AlC MAX phase is an electrical conductor that demonstrates metallic behavior of conductivity in 300-1300 K interval.
13	Nb2AlC by SHS metallothermy	Combustion of Nb2O5–Al–C mixture in the presence of exotermic CaO2–Al additive at 5 MPa Ar pressure.	Uc increases from 6 to 12 mm/s with an increase in the additive content, (up to 15 wt % additive)	Nb2AlC (67 wt %) NbAl3 (24%), NbC (9%).	Kovalev2020 [67]	-
14	Ti3AlC2 and Ti3C2Tx synthesis via SHS grinding	stoichiometry of Ti:Al:C=3:2:1.5, the obtained SHS-ground powder was further ground to a size of <38 mkm.	Tc=1700oC, the duration of whole process was 30-35 s. Ti3C2Tx MXene possess high electrical conductivity (~3267	Ti3AlC2 (82.5%, 10 s delay time),	Pazniak2019 [28]	The formation mechanism of Ti3AlC2 from elements includes Al melting, the reaction between Al and Ti, carbon diffusion in the

			S*cm1)			Ti-Al intermetallics, formation of TiC, Ti-Al-C
15	Sol-gel synthesis of Cr2GaC	Nitrates of Cr and Ga, citric acid, heated at 70-80oC, Ar flow, then annealing of gel at 900oC 5 h.		Cr2GaC, Cr2O3, Cr3C2	Siebert2019 [62]	
16	Zr2SC MAX phase by SHS and the influence of molybdenum addition	Zr:Mo:S:C=2-x:x:1:1 (x = 0 to 1.2) mixtures were hydraulic pressed for molding pellets with 12 mm in diameter and 10 mm in height	Zr2SC phase consisted of belt-like crystals in the order of 40 to 50 nm in width.	Zr2SC with ZrC when x=0, at x=0.2-0.6, Mo2C and Zr are formed along with Zr2SC, at x=0.8 only Zr3S4 and Mo2C are present.	Tomoshige2019 [41]	Mo-added Zr2SC MAX phase might become promising material in the solid lubricity.
17	Ti3SiC2-Ni composite preparation	Ti, Si, technical carbon with 3:1.25:2 ratio, dried at T = 60–70°C, mixed in a ball mill for 1 h. Pressed to 50% porosity, 20 mm in diameter. Then Ni or Ni-Si alloy was added.	-	The more homogeneous composite material based on TiC, TiSi2, and Ti3SiC2 partially filled with the nickel–silicon alloy was formed by alloying 20wt%Ni.	Amosov2019 [26]	An increase in the Ni content (50%) leads to the complete disappearance of the MAX phase.
18	The influence of AlN nanoparticles on TiB/Ti-Based Materials Obtained by	3 mixtures of Ti -87 wt%, B-13 wt%, with 0, 3 and 5 wt% AlN content, relative density of 0.38-0.49.	Tc1=1750-1800oC, Uc1=12mm/s, Tc2=1750-1800oC, Uc2=10mm/s, Tc3=1680-1750oC, Uc3=8mm/s.	Ti2AlN and Ti4AlN3 MAX phases	Bolotskaia2019 [57]	At 5wt% AlN addition MAX phases undergo decomposition.

	SHS Extrusion					
19	Ti/Ti–Al–C system obtained under the SHS compaction	mixture of 64.2 Ti, 27.1 Al, and 8.7 soot wt% dried, ball milled for 4 h, pressed at 5 MPa, cylindrical blanks 30 x20 mm with a relative density of 0.65	Tc=1350-1500oC.	60 wt.% Ti3AlC2 and 10 wt.% Ti2AlC, as well as 20 wt.% of rounded TiC grains and 10 wt.% of the Ti5Al11 and TiAl3	Averichev2019 [30]	-
20	SHS of Ti3SiC2-Based Materials in the Ti–Si–C System: Impact of Silicon Excess	Ti:Si:graphite=3: (1+x):2, ball milling for 24 h, Ar pressure 1.5 atm, hot pressing at 1450oC for 1 h.	SHS-produced powders revealed a plate-like morphology typical of MAX phases	Ti3SiC2 (88.2 wt %) was obtained in case of stoichiometric (x = 0) reaction	Lis2019 [38]	Hot-pressing of SHS-produced powder with x = 0 was found to yield a dense (4.5 g/cm3) polycrystalline material containing 81 wt % Ti3SiC2 and 19 wt % TiC
21	SHS of Nb2AlC MAX phase	Nb2O5, Al, and C powders with a(CaO2 + Al) additive (Tc up to 4250K) in 5 MPa Ar pressure		Nb3Al2C (77%) was formed together with Nb2Al (19%) and NbC (4%) at a=20%	Miloserdov2019 [68]	Tc=2870 K, a>10% the combustion products are separated into two layers under the action of gravity
22	Preparation of Ti3AlC2 by SHS followed by HP	Ti3Al and TiAl intermetallics and pure Ti, Al, C element		80% Ti3AlC2	Goc 2018[19]	Higher residual resistivity ratios than those reported in the literature are found due to lower content of defects.

23	Thermal explosion of Ti3AlC2 phase from MA mixture	Ti:Al:C=3:1:2, ball milled for 1 h, cold pressed at 300 MPa to cylinder 10x15 mm, density 60%, SHS in vacuum, explosion mode in tubular furnace at 1000oC under Ar flow.	Tc=1673oC SHS mode, Tmax=1528oC in explosion mode. Ball-milling did not led to the compositional changes.	Ti3AlC2, and TiC as a byproduct	Akhlaghi2018 [29]	Thermal explosion mode allowed to produce purer MAX Ti3AlC2 phase (85%) than wave propagation mode (60%).
24	Aluminothermic SHS in CaCrO4–Al–C Mixtures under Nitrogen Pressure	(CaCrO4 +2 Al) + nC mixtures, ball milling, ignited under 5 MPa of nitrogen.	Uc decreases from 11 to 7.5mm/s increasing carbon wt% to 3.7%.	At n = 3.7 wt %, practically single-phase Cr2AlC was formed.	Miloserdov2018 [75]	In the absence of graphite (n = 0), Cr2Al was formed.
25	Synthesis of the Ti2AlC MAX Phase	TiO2, Al, carbon black, combusted at 5 MPa argon pressure...	-	Ti2AlC and up to 7% TiC are formed.	Vershinnokov2018 [65]	Replacing carbon black by graphite Ti2AlC with well-defined laminate layers are obtained.
26	Ti3SiC2 preforms with open porosity by MW assisted SHS	Ti:SiC:C=3:1.2:1 mixed, milled 10 min, cold pressed (930 MPa, 60sec) Magnetron power 300-400W.	Tc>1800oC	Ti3SiC2 elongated plate-like grains 10÷20 μm in length and 1 thickness, with inclusions TiC, TiSi2 and SiC.	Dmitruk2018 [61]	If the SHS reaction temperature does not exceed 1330°C, which is the lowest Ti-Si eutectic point, reaction occur by solid-solid mechanism.
27	Single-stage preparation of Cu-Ti3SiC2 composite	3Ti+1,25Si+2C in the presence of Cu, ball milling 1h, cold pressed briquette, density 0.5.	-	Ti3SiC2, with Ti carbide and silicide were formed. In the Cu infiltration region consisting of a mixture of Ti	Amosov2018 [37]	The preparation of Me-Ti3SiC2 composites impregnated with metals Me=Ni, Ti, Fe prevents the formation of the MAX phase. Only 10%Si

				carbide and Ti silicide, adjoins the Cu area.		addition to Cu briquette, increased MAX phase amount markedly.
28	Materials based on the Cr2AlC MAX phase and SHS metallurgy	chromium III and chromium VI oxides of the analytical grade, aluminum and carbon, 5 MPa pressure.	Uc = 7.2 mm/s, nanolaminate structure with the layer thickness from 3 to 20 nm.	Cr2AlC (86%), Cr7C3, Cr2Al8, The bottom layer is metallic (Cr– Al–C) and the top layer is oxide (Al2O3).	Gorshkov2017 [76]	An increase in the content of the Cr2AlC MAX phase and a decrease in the Cr5Al8 content occur with an increase in the C and Al content.
29	Cr2AlC MAX phase by SHS metallurgy	-	High stability in HCl and HF media up to 120h	95%Cr2AlC, pure according to XRD	Gorshkov 2017 [76]	
30	Ti3(Al,Sn)C2 solid solutions by combustion synthesis	Ti, Al, Sn, carbon black, Al4C3, TiC, to obtain Ti3(Al1–xSnx)C2, where x =0-0.8 mol	Tc=1590-1700 oC Uc= 14.2–18.8 mm/s for Al4C3-added samples, and Tc= 1220–1280 oC and Uc=7.1–9.6 mm/s, for the TiC added samples	Ti3(Al,Sn)C2 grains were plate-like and closely stacked into a laminated microstructure, with a thickness about 1 μm and a size of 6–10 μm.	Yeh Chiang2017 [46]	The extent of Sn substitution for Al to form Ti3(Al,Sn)C2 is narrower for the TiC-adopted sample y=0.6, but wider for Al4C3 one x=0.8.
31	Ti2AlN ceramic by the thermal explosion (TE) technique	1.1:1.1:1(Ti: Al: TiN mixture,milled for 4h, compressed into cylindrical discs, put into preheated furnace 700oC, after holding 2 min were colled down and examined. Tad (Ti-Al)=1517K		Ti2AlN ceramic containing 4% TiN could be fabricated at 700 °C for 2 min. It was further found that small particle size of TiN and compacts' height of 2–8 mm were beneficial to obtain	Liu2017 [51]	Moderate excess of Ti and Al in the powder mixtures is beneficial to the formation of high purity Ti2AlN. Higher excess of Ti and Al lead to high Tad and decomposition of MAX phase.

				high purity Ti2AlN		
32	SHS of Ti2AlN and its hot pressing	Ti3Al, Al, N2 (+50% Al excess) 1.5-5 atm N2 pressure, ignition time up to 60s.	Hot pressing of powders at 1250, 1300, 1350 and 1400°C, time of annealing 1 hour, P_{N2}=25 MPa	The highest content of 211 phase was obtained from hot pressing at 1300°C for 1hour (73.9 wt.% of Ti2AlN)	Chlubny2017 [53]	At 1400°C composite material containing 60.4 wt.% of Ti4AlN3 and 35.9 wt.% of Ti2AlN was obtained.
33	Effect of Al on formation of TaC, Ta2C, and Ta2AlC by SHS aluminothermy	Ta2O5, Al, Al4C3, and carbon black, ball milled, cold pressed (7x12mm), cylinders with 50%density.	Uc=1450-2000oC, Uc=8-14 cm/s	Ta2AlC, TaC, Ta2C and Al2O3. When Al is the only Al source MAX formation was improved	Yeh 2017 [78]	Compared to Al4C3, elemental Al was demonstrated to be a more effective reductant for Ta2O5.
34	The preparation of boron containing MAX phase	3Ti+2Al+2((1-x)C+xB), where x is the fraction of boron atoms, mixing drying, pressing up to 40% density, 23x11mm in size.		(x=0.10-0.50), Ti3AlC2 and TiC are formed, but When x=0.75 and 0.9, TiB and TiB2 are formed with AlTi3.	Amosov2017 [32]	ParIf more than half of the carbon atoms is replaced by boron atoms in the charge, the MAX-phase is not formed, and TiB, TiB2 and Al3Ti become the main synthesized phases.
35	Mechanochemical synthesis mechanism of Ti3AlC2 MAX phase	Ti, Al and graphite with stoichiometric 3:1:2 ratio, milled by a planetary ball mill up to 10 h.	After 8.33 h of milling time, the temperature of vial increased rapidly initiating combustion	Ti3AlC2, TiC.	Shahin2016 [17]	The direct temperature measuring of the powders during ball milling was impossible.
36	Ti2AlC MAX phases with TiC carbide by MW	Ti, graphite, Al, 2:1:1 ratio, mixing 10 min, uniaxial cold-	Tig = 670°C, when the melting point of Al was attained.	Ti2AlC plate-like grains with TiC crystals	Koniuszewka2016 [27]	Ti2AlC is supposed to be fabricated by a solid-liquid reaction during the

	assisted SHS	pressing, pellets of 23 mm in diameter under a pressure of 800 MPa for 10 second. Magnetron power 200-400W.	Tc=1600oC. Compact deformation includes axial elongation and radial contraction.			cooling process, the Ti2AlC MAX phase is precipitated from the solution of TiC and Al-Ti melt during the peritectic reaction.
37	Rapid synthesis of Ti2AlN ceramic via thermal explosion	Ti/Al/TiN= 1:1.05:1 as raw material at ignition temperatures ranging from 650 oC to 850 oC for 2 min		Ti2AlN, TiN	[52] Liu2015	
38	MA SHS Ti3AlC2 (pressed by force SHS pressing, 7 MPa)	Elements of 312 ratio, ball milling 16h, after milling 2wt% Al was added. Double side pressing, 55% packing density	MA 1-5 min, Tc decreases from 2000 to 1700oC with MA, combustion velocity has unstable behavior	Ti3AlC2 (45%), TiC (34%) and Ti2AlC (13%) at 5 min MA	Potanin 2015 [15]	By adding TiH2, the content of Ti3AlC2 MAX phase can be increased after SHS. Optimal MA duration is 3 min. MA increases TiC content.
39	To obtain large, dense samples of MAX-phase Ti3AlC2	SHS synthesized Ti-Al intermetallics, Ti, graphite, ball milling 24h, then SHS of powder mixture. SHS prepared Ti2AlC powder was hot-pressed at 1100◦C, for 1 hour at 25MPa. In the case of Ti3AlC2 powder temperature was 1300◦C.		After SHS 73.8 wt.% of Ti3AlC2, 11.3 wt.% of Ti2AlC, and 14.8 wt.% of TiC. Ti2AlC phase (95.4 wt%) and TiAl2 phase (4.6 wt.%). After hot pressing (98.7 wt.% of Ti2AlC) with low amount of TiC impurities, and Ti3AlC2 90.3 % and	Chlubny 2015 [47]	SHS and HP combination allot to obtain single phase (Ti2AlC) or near single phase (Ti3AlC2) materials. First one was porous, second one - very dense.

				TiC9.7% at 1300oC.		
40	Ti3SiC2, Ti3AlC2	Ti, Al, Si, carbon, TiC, TiAl,TiSi2, SHS in air of 8h milled, cold pressed (~50%) samples	Tc=2000oC in the absence of TiC or TiAl	Ti3AlC2 with traces of TiC, TiAl Ti3SiC2 with some TiSi2, TiC	Sun2014 [20]	Aluminum should be taken in excess, titanium-coarse grained, soot - instead of graphite, TiC or TiAl as diluents to provide mild combustion, lower than the decomposition temperature of MAX phases
41	$(Cr.V)_2AlC$/ Al2O3 with different substitutional proportions by SHS aluminothermy	SHS of Cr2O3–V2O5–Al–Al4C3 (1) and Cr–V2O5–Al–Al4C3 (2), ball milled, pressed to 7x13mm cylinders, 55 % relative density, in Ar pressure	Reaction (1) Uc = 1.3 - 4.7 mm/s for the increase of x = 0.1-0.4, and Uc = 5.5 mm/s at x=0.7, at that Tc = 1212 - 1605 oC. For Reaction (2), Uc =2.6 - 12.5 mm/s within y = 0.4–0.7. up to 1400 oC at y = 0.5 and 1670 oC at y = 0.7.	Hexagonal Al2O3-added (Cr1-xVx)2AlC composites with x = 0.1–0.7 in mixture 1. In mixture 2, (Cr1-yVy)2AlC with y = 0.4 was possible,. y>0.4, in addition to MAX phase (Cr.V)2C forms.	Yeh 2014 [77]	Combustion limit was observed at y<0.3 because of low exothermicity, but y>0.5 didn't lead to MAX phase due to high velocity and insufficient reaction time. The use of Al4C3 instead of carbon powders is to prevent oxide precursors from carbothermic reduction.
42	Ti2AlC bulk pellets, Φ150 × 25 mm2 in size by SHS and pseudoHIP	Ti:Al:C(carbon black)= 2.9:2:1 were used to fabricate Ti2AlC, milling 10h, compressing 250kN for 15s,		Ti2AlC, and TiAl	Bai2014 [84]	The density and grain size of Ti2AlC produced by the SHS/ PHIP process both increase with increasing size of the pellet (mean grain size is

		150mmx25mm and 55mmx20mm disks				2.57mkm). The larger volume results in more heat, which would keep the fabricated product hot and plastic in high temperature for the longer time.
43	Thermodynamic predictions for the Ti2AlC MAX-phase	Enthalpy-temperature calculations are presented for the reaction 2Ti + (1+y)Al + C → Ti2AlC + yAl	If excess Al is added as a diluent, there is a decrease in Tad but it offers the potential to control the exothermicity of the SHS.	Tad ≥ 1800K and -ΔHr 298K/Cp 298K≥ 2000K, are shown to be applicable for Ti2AlC MAX phase	Thomas2014 [10]	XRD confirms the presence of aluminium in samples with Al excess (y=0.3). The predicted Tad for the 2Ti: 1Al: 1C mixture of 2368K is similar to reported experimental data.
44	Ti2AlCx, Ti3AlC2x, and Cr2AlCx by SHS-PHIP from Ti-Cr-Al-C system ((2-m):m:1:1)	Ti, Cr, Al, and carbon black ball milled using ethanol, ZrO2 balls, 12h. Compacted 20 MPa for 30s. After SHS they pressed by PHIP of 225 MPa, for 10-25s at 1550-1680 K.	When m of 0, 0.25, 0.50, 0.75, 1.00, 1.25, and 1.50, Tc are 2194.3, 1655.8, 1598.1, 1558.2, 1301.5, 1256.9, and 1192.5 oC. m=1.75 and 2, no SHS mode.	Ti2AlCx, Ti3AlC2x, and Cr2AlCx by SHS were detected in the Ti–Cr– Al–C systems, as well as the binary carbide of TiC and intermetallics. Rod like structures are formed.	Ying2013 [12]	Samples subjected to SHS-PHIP comprise higher density than only SHS prepared samples.
45	Ti2AlN by SHS	2Ti, 1Al and 37wt%TiAl mixture as raw materials under different N2 pressures. Wet mixing in ethanol 8h.		Ti2AlN mainly,but there are TiN and AlTi3 impurities. AlTi3 disappears at P=8 MPa N2	Tian2013 [54]	Increasing N2 pressure, the relative content of TiN increases, AlTi3 decreases. Layered grains of the products become larger and tighter with

		P=2,4,6,8 MPa N2				increasing N2 pressure.
46	MAX solid solutions (Ti1-x,Vx)2AlC and (Cr1-y,Vy)2AlC with Al2O3 addition	TiO2/V2O5/Al/Al4C3 and Cr2O3/V2O5/ Al/Al4C3 powder mixtures, ball milled, cold pressed, 55% density, 7x12 mm cylinder, Ar atmosphere	Uc of Reaction (1) increases from 1.4 to 4.8 mm/s, at x=0.3-0.7, Tc=1150-1550oC. When y=0.1-0.7, Tc=1200-1600oC, Uc= 2.2-5.5 mm/s	At x>0.4, (Ti,V)2AlC, Al2O3, (Ti,V)C are formed. When y=0.1-0.7, (Cr,V)2AlC, Al2O3, and 4.5-6.4wt% Cr7C3 were present.	Yeh 2013 [66]	Increasing V2O5, increases the combustion temperature and reaction front velocity, facilitates the evolution of solid solution.
47	Cr2AlC reinforced with alumina	Cr2O3–Al–Al4C3 powder compact with 3:5x:y ratio, x,y=1-1.5, dry milled, cold-pressed, cylinder 7x12mm, compaction density 60%, preheating 300oC	Tc=1245oC for 3:7.5:1 mixture, spinning combustion mode, Uc~3 mm/s. Uc=1.5 mm/s was detected for 3Cr2O3 + 5Al + 1.5Al4C3 mixture	Cr2AlC and Al2O3, with traces of Cr7C3	Yeh 2011 [70]	Combustion temperature and reaction front velocity increased with content of Al, but decreased with that of Al4C3.
48	(Ti1-xNbx)2AlC solid solutions, M-site solid solutions	from elemental Ti, Nb, Al carbon black and Ti, Al, Nb2O5/Al4C3-compacts, x=0.2-0.8	Uc decreases from 7.6 to 3.6 mm/s for elemental mixture with increasing x from 0.2 to 0.8 (Tc=1200 to 1057oC). Uc increases 4.1 to 11.4 mm/s from x=0.3 to 0.8 for thermite mixture (Tc=1160 to 1652oC)	(Ti,Nb)2AlC and TiC from elements, and (Ti,Nb)2AlC, Al2O3, Nb2Al from the thermite mixture were produced	Yeh2011 [33]	

49	Ti2AlC0.5N0.5 by combustion synthesis	Ti:Al4C3:Al (or AlN) = 2:1/6:1/3, milling cold pressing, SHS in N2 atmosphere	By increasing N2 pressure Tc and U increase, TiC amount too.	Ti2AlC0.5N0.5 with TiC, TiN, Ti3Al, AlN	Yeh2010 [50]	Al containing mixture has higher exothermicity than AlN containing one.
50	SHS of Ti3AlC2/Al2O3 and Ti2AlC/Al2O3 composites	Ti–Al–C–TiO2 system, ball milling, cold pressing, SHS in Ar	Decrease in both Tc (from 1466 to 1313 K) and Uc (from 14.3 to 0.95 mm/s) was observed at formation of Ti2AlC and Ti2AlC/Al2O3, respectively.	Ti3AlC2/Al2O3 and Ti2AlC/Al2O3	Yeh2010 [63]	
51	Ti2AlN by Solid–Gas SHS with AlN- and TiN-Diluted Samples in N2	Elements, AlN, TiN ball milled, cold pressed, N2 pressure from 0.45-0.79 MPa		Ti2AlN, TiN and Ti-Al	Yeh2010 [55]	TiN dilution at low pressure was more beneficial, than AlN at high N2 pressure.
52	Ti2AlC by laser induced SHS sintering	2Ti/Al/C/Sn raw mixture. Mixing, milling 2h in ZrO2 ball media, cold pressed, SHS in CO2 laser.		Ti2AlC (83wt%) and TiC	Liang2010 [18]	Sn additive improved the synthesis of Ti2AlC.
53	Nb2AlC by SHS	3Nb2O5–xAl–Al4C3 powder compacts	Increasing Al from 9 to 13 mol, decrease in Tc from 1800 to 1200oC, and Uc from12.5mm/s to 7.5 mm/s was observed.	Nb2AlC, Al2O3, NbC, NbAl3	Yeh2010 [69]	The formation of Nb2AlC was effectively improved by the samples containing an appropriate amount of additional Al or Al4C3.

54	Synthesis of Ti3AlC2, Ti3AlC, and Ti2AlC	Elements in the presence of TiAl	The use of TiAl significantly reduces the combustion temperature	Ti3AlC2, Ti3AlC, and Ti2AlC	Lopacinski2010 [48]	Short letter
55	Synthesis of nanolayered composite by SHS and PHIP	Ti:Cr:Al:C 1.5:0.5:1:1 mixing, milling, pressing, PHIP after SHS	T=1800K, pressing between cooling 1610-1260K at 225 MPa for 25 s	Ti3AlC2, Cr2AlC and TiC bulk nanoceramic	Ying2010 [87]	The formation of the MAX phases is detected as in situ synthesis while the system is cooling.
56	MA SHS in Ti-Al-C	Elements, up to 40h milling, 250 rpm		Ti2AlC and Ti2AlC/Ti3AlC2	Hendaoui2010 [16]	MA increases TIC amount, cooling rate was found beneficial for SHS control, Al excess promote MAX phase formation
57	The influence of Al on Ta2AlC SHS process	Ta:Al:C = 2:1:1. Ta:Al:C = 2:1.4:0.8 and 2:1.6:0.8, ball milled, cold pressed, SHS in Ar.	Al decreases Uc from 6.5mm/s to 3mm/s, and Tc from 1250 to 1050oC but contribute to Ta2AlC formation.	Ta2AlC, Ta4AlC3, Ta2C. Single-phase Ta2AlC was obtained from Ta:Al:C = 2:1.6:1.	Yeh2009 [40]	
58	The impact of TiC and Al4C3 addition on the SHS process of Ti-Al-C system	Ball milling of elemental powder compacts of Ti:Al:C = 2:1:1 in the presence of TiC(6.67–14.3 mol%, and Al4C3 (1.96–10 mol%), SHS in Ar	Tc1=1200oC, Uc=14.3mm/s. Tc2=1100oC with TiC, Tc3=900oC with Al4C3	Ti2AlC, TiC	Yeh2009 [45]	TiC diluted mixture produces up to 90%MAX phase in the product.
59	Bulk Ti2AlC by SHS and pseudo HIP	10 h milling of elements non-stoiciometric mixtures 2.9:2:1, SHS		Nonstoichiometric Ti2AlCx (x = 0.69) with grain size of 6 mkm with some	Bai 2009 [85]	.

		in air		TiAl		
60	Al4C3 influence on Ti3AlC2 by SHS	both the elemental powder compacts of Ti:Al:C = 3:1:2 and the Al4C3 (1.85-5.56 mol%) containing samples were ball milled, cold pressed and combusted in Ar	Tc=1300-1400oC	Ti3AlC2, Ti2AlC, TiV	Yeh2009 [43]	With an increase in the Al4C3 content, Tc and Uc decreased, but the degree of Ti3AlC2 formation was improved.
61	SHS in Ti-Al-C system	Elements, mixing, milling, pressing to a relative density 60%, in Ar	Tc=2000K	Ti2AlC with up to 2wt%TiC	Hendaoui2008 [11]	Fast heating, long dwell at given temperature, fast cooling
62	Ceramic nanolaminates, of Ti3SiC2, Ti3AlC2 and Ti2AlN by SHS	Ti, C, TiAl and Ti3Al, mixing, SHS in nitrogen atmosphere	See Pampuch 1989	Ti3AlC2 was 40wt% when using TiAl and up to80% when using Ti3Al Ti2AlN accompanied by small amount of TiN, Ti3AlN and Ti3Al when TiAl or Ti3Al were used.	Lis2008 [58]	Using both TiAl and Ti3Al, then TiN as a dominating phase and small quantities of Ti2AlN, Ti3Al and AlN are formed.
63	Ti2AlC and Ti3AlC2	Elements, TiC, ball milling 8h		Ti2AlC, TiC Ti3AlC2, TiC	Liu2007 [24]	
64	SHS in 7 different Ti-Al-C-N systems	Ti-Al-C 312 TiAl, 2Ti, 2C Ti3Al, 2C 4Ti,2Al, N2 2TiAl, 2Ti, N2 Ti3Al, 2Al, 3N2	83% TiC, 17% Ti2AlC 64% TiC, 36% Ti3AlC2 87% Ti3AlC2, 13% TiC 66% TiN, 15% AlN, 7% Ti3AlN, 12% (TiAl+Ti3Al+AlTi3) 57% Ti2AlN, 24% TiN, 11% Ti3Al, 8%		Chlubny 2006 [49]	Low nitrogen pressure during Ti2AlN synthesis promotes the formation of ternary compounds.

		Ti3Al,TiAl,N2, loose powder bed, 0.5 MPa N2 pressure	Ti3AlN 54% TiN, 23% Ti2AlN, 17% Ti3Al, 6% AlN 54% TiN, 23% Ti2AlN, 17% Ti3Al, 6% AlN			
65	SHS of Ti2AlC1-x	Ti:Al:C=3:1.5:1=2:1:0.7, ball milling 8h, cold pressing, vacuum combustion.	The maximum temperature for the formation of Ti2AlC1-x is about 1625±10oC	Ti2AlC1-x, Ti3AlC2, TiC	Chen 2004 [25]	The reaction Ti+C=TiC is the main heating resource for driving the reactions leading to the formation of ternary carbides.
66	SHS of Ti3SiC2	Using 3Ti + SiC + C reactants, mixing, cold pressing at 180 MPa, preheating, >100^{o}/min,T_{ig}=870^{o}C		78%Ti3SiC2, 17%TiCx and 5%Ti5Si3Cx	Riley 2003 [59]	
67	Dense Ti3SiC2-based ceramics by thermal explosion (TE)	Elements 3:1:2 ratio, 1 min 80 MPa pressure during TE (so called reactive forging)	1. Tc=1800oC 2. TE of 3Ti–Si–2C 1000oC preheated compacts observed with Tc=1200oC.	45 vol.% Ti3SiC2 wih TiC, Ti5Si3 or Ti3SiC2–TiSi2–SiC eutectic mixture	Khoptiar 2003 [35]	
68	SHS in the Ti-Al-C mixture with different amounts of elements	Ti, Al, C mixture, 8h ball milled, cold-pressed. SHS in vacuum	Tc=1800oC	Ti3AlC2, Ti2AlC, TiC	Ge2003 [23]	Of note, TiC with Al coated core-shell composite will be beneficial for reactive sintering and SHS.
69	Ti3SiC2 formation mechanism	3Ti – SiC - C, cold pressed mixture, Vh=100oC/min	Tc= 2320°C, conversion degree 80wt%	Ti3SiC2, TiCx	Riley2002 [60]	
70	Pressure-assisted TE synthesis of dense Ti2AlC	2Ti-Al-C, 30 MPa pressure during TE at 800 oC.		Ti2AlC up to 90% and TiC1-x during pressureless synthesis, but	Khoptiar2002 [22]	Ti2AlC was formed during cooling from the high combustion temperature (>2000 oC)

				pressure assisted TE lead to an appreciable amount of TiC1-x.		by a peritectic reaction between the earlier formed liquid Ti aluminides and a solid Ti carbide, TiC1-x
71	Ti3AlC2 and Ti2AlC by SHS	Ti, Al, C, ball milled for 24h, 2:1:1 ratio, cold-pressed, SHS in vacuum.	Uc=2.8-7.9 mm/s	Ti3AlC2 and Ti2AlC (after acid leaching aimed at removal of TiAl)	Zhou 2001 [13]	Authors recommended to use Al4C3 instead of Al, as the latter has high vapor pressure.
72	TiAlC2 single step SHS in controlled mode	TiAl, C mixture was ball milled for 6 h, loose powder bed in graphite boat, SHS in 1 atm Ar	Tc=1396oC, Uc=5.9mm/s for Ti3AlC2	Ti3AlC2, TiC	Lopacinski 2001 [44]	TiAl using reduces Tc, hence easy to deagglomerate powder
73	Ti3SiC2 by the field-activated, pressure-assisted combustion method	Ti, Si, graphite, 20 h ball milling, 3:1:2 ratio, cold pressed	Uc=18.8 mm/s Tc= 2260 °C, (Tad= 2735°C)	Ti3SiC2, 2%TiC	Feng 1999 [36]	The greatest conversion (>98%) is attained for samples held at 1525°C for 2 h after SHS ignition. When holding time is zero, only TiC is observed.
74	Ti-Al-C ternary system	Ti, TiAl, Al, TiC, Al4C3, graphite		Ti2AlC, Ti3AlC, Ti3AlC2	Pietzka1994 [91]	The newly discovered phase was isotopic with Ti3SiC2
75	Ti3SiC2 preparation by SHS	Using elemental powders 3:1:2, preheating of mixture inductively up to 800oC, then rapidly at a rate of 500K/rain, to 1050-		Ti3SiC2 with some TiC	Pampuch 1989 [2]	Curious mechanical properties of MAX phases were observed. This work opened new platform for further exploration of MAX phases.

	1200°C.