WHAT IS CLAIMED IS:

1. An abrasive article comprising:

a bonded abrasive body having abrasive particles comprising microcrystalline alumina (MCA) contained within a single phase vitreous bond material, wherein the bonded abrasive body has a porosity of at least about 42 vol% of the total volume of the bonded abrasive body, the bonded abrasive body capable of grinding a workpiece comprising metal at a speed of at least about 60 m/s at a material removal rate of at least about 0.4 in^3/min/in (258 mm^3/min/mm), wherein the bond material includes at least 45 vol% SiO_2.

2. The abrasive article of claim 1 in which the bonded abrasive body has a corner holding factor of not greater than about 0.07 inches (1.78 mm) at a depth of cut of 1.8.

3. The abrasive article as recited in any of claims 1 and 2, wherein the bond material is formed from not greater than about 20 wt% boron oxide (B_2O_3) for the total weight of the bond material.

4. The abrasive article as recited in any of claims 1, 2 and 3, wherein the bond material comprises a ratio of weight percent silicon oxide (SiO_2): weight percent aluminum oxide (Al_2O_3) of not greater than about 3.2.

5. The abrasive article as recited in any of claims 1, 2, 3 and 4, wherein the bond material is formed from not greater than about 3.0 wt% phosphorous oxide (P_2O_5).

6. An abrasive article comprising:

a bonded abrasive body having abrasive particles comprising microcrystalline alumina (MCA) contained within a single phase vitreous bond material formed from not greater than about 20 wt% boron oxide (B_2O_3) and at least 45 vol% silica (SiO_2), having a ratio of weight percent silica (SiO_2): weight percent alumina (Al_2O_3) of not greater than about 3.2 (by weight percent) wherein the bonded abrasive body has a porosity of at least about 42 vol% of the total volume of the bonded abrasive body, and the bonded abrasive body is capable of grinding a workpiece

comprising metal at a speed of at least about 60 m/s with a depth of cut of at least about 0.003 inches (0.076 mm).

7. The abrasive article as recited in any one of claims 1 and 6, wherein the bonded abrasive body is capable of grinding the workpiece at a maximum power of not greater than about 10 Hp.

8. The abrasive article as recited in any one of claims 1, 6 and 7, wherein the abrasive particles consist essentially of microcrystalline alumina.

9. The abrasive article as recited in any one of claims 1, 6, 7 and 8, wherein the bonded abrasive body comprises a porosity of at least about 43 vol% and not greater than about 70 vol% of the total volume of the bonded abrasive body.

10. The abrasive article as recited in any one of claims 1, 6, 7 and 8, wherein the bonded abrasive body comprises at least about 35 vol% abrasive particles of the total volume of the bonded abrasive body.

11. The abrasive article as recited in any one of claims 1, 6, 7 and 8, wherein the bond material comprises an alkali oxide compound (R_2O) selected from the group of compounds consisting of lithium oxide (Li_2O), sodium oxide (Na_2O), potassium oxide (K_2O), and cesium oxide (Cs_2O) and a combination thereof.

12. The abrasive article as recited in any one of claims 1, 6, 7 and 8, wherein the bond material is formed from at least one alkali oxide compound (R_2O) and at least one alkaline earth oxide compound (RO), wherein the total content of the alkali oxide compound and the alkaline earth oxide compound is not greater than about 20 wt%.

13. The abrasive article as recited in any one of claims 1, 6, 7 and 8, wherein the bond is formed from a composition comprising not greater than about 1 wt% of oxide compounds selected from the group consisting of MnO_2, $ZrSiO_2$, $CoAl_2O_4$, and MgO.

14. An abrasive article comprising:

a bonded abrasive body having abrasive particles comprising microcrystalline alumina (MCA) contained within a single phase vitreous bond material formed from not greater than about 20 wt% boron oxide (B_2O_3) and at least 45 vol% silica (SiO_2),

having a ratio of weight percent silica (SiO_2): weight percent alumina (Al_2O_3) of not greater than about 3.2 (by weight percent) wherein the bonded abrasive body has a porosity of at least about 42 vol% of the total volume of the bonded abrasive body, and the bonded abrasive body is capable of grinding a workpiece comprising metal at a speed of at least about 60 m/s with a depth of cut of at least about 0.003 inches (0.076 mm), wherein the bonded abrasive body has a content of the bond material of not greater than 15 vol% of the total volume of the bonded abrasive body.

WHAT IS CLAIMED IS:

1. An abrasive article comprising:

a bonded abrasive body having abrasive particles comprising microcrystalline alumina (MCA) contained within a single phase vitreous bond material comprising not greater than about 20 wt% boron oxide (B_2O_3), a total content of alkali oxide compounds (R_2O) of at least 14 wt% and not greater than 18 wt%, a ratio of weight percent silica (SiO_2): weight percent alumina (Al_2O_3) of not greater than about 3.2 (by weight percent),

wherein a content of any individual alkali oxide compound in wt% is not greater than one half of a total content of the alkali oxide compounds in wt% within the bond material,

wherein the bonded abrasive body has a porosity of at least 51 vol% and not greater than 70 vol% of the total volume of the bonded abrasive body, a bond content of at least about 6 vol% and not greater than about 14 vol% of the total volume of the bonded abrasive body, and

wherein the bonded abrasive body is capable of grinding a workpiece comprising metal at a speed of at least about 60 m/s.

2. An abrasive article comprising:

a bonded abrasive body having abrasive particles comprising microcrystalline alumina (MCA) contained within a bond material, wherein the bonded abrasive body has a porosity of at least 51 vol% and not greater than 56 vol% of the total volume of the bonded abrasive body, a bond content of at least about 6 vol% and not greater than about 14 vol% of the total volume of the bonded abrasive body, an abrasive particle content of at least about 42 vol% and not greater than about 52 vol%, a total content of alkali oxide compounds (R_2O) of at least 14 wt% and not greater than 18 wt%, wherein a content of any individual alkali oxide compound in wt% is not greater than one half of a total content of the alkali oxide compounds in wt% within the bond material, and wherein the bonded abrasive body capable of grinding a workpiece comprising metal at a speed of at least about 60 m/s, and having a corner holding factor of not greater than about 0.07 inches (1.78 mm) at a depth of cut of 1.8.

3. The abrasive article of claim 1, wherein the abrasive particles consist essentially of microcrystalline alumina.

4. The abrasive article of claim 1, wherein the abrasive particles have an average particle size of not greater than about 250 microns.

5. The abrasive article of claim 1, wherein the microcrystalline alumina comprises grains having an average grain size of not greater than about 1 micron.

6. The abrasive article of claim 1, wherein the bond material comprises a single phase vitreous material.

7. The abrasive article of claim 1, wherein the bonded abrasive body comprises a porosity of not greater than about 60 vol%.

8. The abrasive article of claim 2, wherein the bond material comprises at least about 11 wt% and not greater than about 20 wt% boron oxide (B_2O_3) for the total weight of the bond material.

9. The abrasive article of claim 2, wherein the bond material comprises a ratio of weight percent silicon oxide (SiO_2): weight percent aluminum oxide (Al_2O_3) of not greater than about 3.2.

10. The abrasive article of claim 1, wherein the bond material comprises not greater than about 3.0 wt% phosphorous oxide (P_2O_5).

11. The abrasive article of claim 10, wherein the bond material is essentially free of phosphorus oxide (P_2O_5).

12. The abrasive article of claim 1, wherein the bonded abrasive body has a content of the abrasive particles of at least about 42 vol% and not greater than about 52 vol% of the total volume of the bonded abrasive body.

13. The abrasive article of claim 1, wherein the bond material has a content of silica (SiO_2) of at least at least about 48 wt% and not greater than about 52 wt%.

14. The abrasive article of claim 1, wherein the bond material has a content of alumina (Al_2O_3) of at least about 15 wt% and not greater than about 20 wt%.

15. The abrasive article of claim 1, wherein the bond material has a total content of silica (SiO_2) and boron oxide (B_2O_3) of at least 55 wt%.

16. The abrasive article of claim 1, wherein the bond material consists essentially of a vitreous bond material.

17. The abrasive article of claim 1,

wherein the bonded abrasive body has a porosity of at least 52 vol% and not greater than 56 vol%, and a content of the abrasive particles of at least 42 vol% and not greater than 52 vol% of the total volume of the bonded abrasive body; and

wherein the bond material has a content of silica (SiO_2) of at least at least 48 wt% and not greater than 52 wt%, a content of alumina (Al_2O_3) of at least about 15 wt% and not greater than 20 wt%, and a content of boron oxide (B_2O_3) of at least 10 wt% and not greater than 17 wt% for the total weight of the bond material.