CLAIMS

1. A planar armature for an axial flux machine, the planar armature comprising:

a first layer comprising a first dielectric substrate;

a second layer comprising a second dielectric substrate; and

a third layer disposed between the first layer and the second layer, wherein the third layer comprises:

first conductive traces that form at least first portions of windings for at least a first pole of the planar armature,

a first quantity of a magnetic composite material disposed in interstices between the first conductive traces within at least a first region of the third layer, wherein the magnetic composite material comprises particles of a soft magnetic material embedded within a first dielectric material and the first region is located within an active area of the axial flux machine, and

a second quantity of a second dielectric material disposed within at least a second region of the third layer, wherein the second dielectric material is free of the soft magnetic material and the second region is located outside of the active area.

2. The planar armature of claim 1, wherein the soft magnetic material comprises a powdered soft magnetic material.

3. The planar armature of claim 2, wherein the first dielectric material comprises an epoxy.

4. The planar armature of claim 1, wherein a maximum diameter of the particles is 50 micrometers or less.

5. The planar armature of claim 1, wherein at least a portion of the magnetic composite material is disposed within etched regions of a copper clad laminate sheet.

6. The planar armature of claim 1, wherein:

the first conductive traces comprise radial conductive traces within the active area, and

the magnetic composite material is disposed in interstices between the radial conductive traces.

7. The planar armature of claim 3, wherein the second dielectric material comprises an epoxy.

8. The planar armature of claim 1, wherein the second dielectric material comprises an epoxy.

9. The planar armature of claim 1, wherein:

the first dielectric substrate and the first conductive traces are components of a first etched copper clad laminate sheet;

the second dielectric substrate is a component of a second etched copper clad laminate sheet, wherein the second etched copper clad laminate sheet includes second conductive traces that form at least second portions of the windings for the first pole of the planar armature; and

the second conductive traces are disposed on a fourth layer of the planar armature, the fourth layer being disposed between the second layer and the third layer.

10. The planar armature of claim 9, further comprising: a fifth layer comprising prepreg, the fifth layer being disposed between the third layer and the fourth layer.

11. The planar armature of claim 10, further comprising:

a third quantity of the magnetic composite material disposed in interstices between the second conductive traces within at least a third region of the fourth layer, wherein the third region is located within the active area of the axial flux machine, and

a fourth quantity of the second dielectric material disposed within at least a fourth region of the fourth layer, wherein the fourth region is located outside of the active area.

12. The planar armature of claim 11, wherein:

the first conductive traces are disposed on a first side of the first etched copper clad laminate sheet; and

third conductive traces are disposed on a second side of the first etched copper clad laminate sheet opposite the first side, wherein the third conductive traces are disposed in a sixth layer of the planar armature and form at least third portions of the windings for the first pole of the planar armature.

13. The planar armature of claim 12, further comprising:

a fifth quantity of the magnetic composite material disposed in interstices between the third conductive traces within at least a fifth region of the sixth layer, wherein the fifth region is located within the active area of the axial flux machine, and

a sixth quantity of the second dielectric material disposed within at least a sixth region of the sixth layer, wherein the sixth region is located outside of the active area.

14. The planar armature of claim 9, further comprising:

a third quantity of the magnetic composite material disposed in interstices between the second conductive traces within at least a third region of the fourth layer, wherein the third region is located within the active area of the axial flux machine, and

a fourth quantity of the second dielectric material disposed within at least a fourth region of the fourth layer, wherein the fourth region is located outside of the active area.

15. The planar armature of claim 1, wherein:

the first dielectric substrate and the first conductive traces are components of a first etched copper clad laminate sheet; and

the second dielectric substrate comprises prepreg.