IDENTIFIABLE COMPOSITE REWORK SYSTEM AND METHOD

TECHNOLOGICAL FIELD

The present disclosure relates generally to the field of composite rework and composite rework materials, systems, and methods. More specifically the present disclosure relates to the field of detecting regions of composite rework, and detectable composite rework materials, systems, and methods.

BACKGROUND

As the use of composite materials in manufacturing continues, there exists a continuing need to rework such materials. For various composite material products, repeated rework of a composite material section may not desired, or may not be allowed by regulation. Determining the existence and location of a previously reworked section is desirable.

SUMMARY

Aspects of the present disclosure are directed to a composite rework material including a fiber-containing material, a resin-containing material, and a dopant, with the dopant configured to impart an identifying characteristic to the composite rework material.

In another aspect, the identifying characteristic is detectable by a detector.

In a further aspect, the identifying characteristic is a visual characteristic that is detected visually.

Further disclosed aspects are directed to objects comprising a substrate, with the substrate including a composite rework material, with the rework material including, for example, a fiber-containing material, a resin-containing material, and a dopant, and with the dopant configured to impart an identifying characteristic to the composite rework material.

Further disclosed aspects are directed to objects, including structural objects such as, for example, buildings, bridges, etc., with such objects including a composite rework material including a fiber-containing material, a resin-containing material, and a dopant, with the dopant configured to impart an identifying characteristic to the composite rework material.

According to another disclosed aspect, vehicles include a composite rework material including a fiber-containing material, a resin-containing material, and a dopant, said dopant configured to impart an identifying characteristic to the composite rework material. Such vehicles include, for example, a manned spacecraft, an unmanned spacecraft, a manned

rotorcraft, an unmanned rotorcraft, a drone, a satellite, a manned terrestrial vehicle, an unmanned terrestrial vehicle; a manned surface marine vehicle, an unmanned surface marine vehicle, a manned sub-surface marine vehicle, an unmanned sub-surface marine vehicle, etc., and combinations thereof.

Further aspects of the present disclosure provide methods for reworking a composite substrate material on a composite substrate (e.g., including a laminated composite substrate, etc.), including defining a composite structure requiring rework and applying a doped composite rework material, with the composite rework material (e.g., composite rework material "patch", etc.), with the rework material including a fiber-containing material, a resin-containing material, and a dopant, and with the dopant configured to impart an identifying characteristic to the composite rework material.

In a further aspect, presently disclosed methods include curing the doped composite material.

According to a present aspect, methods for detecting a previously reworked composite material region on a composite substrate and methods for precluding reworking a previously reworked composite substrate material region on a composite substrate are disclosed. One presently disclosed method includes applying a doped composite material to a composite substrate material to form a doped composite rework material applied to a composite substrate to form a doped composite material rework region on the composite substrate, with the doped composite rework material including a fiber-containing material, a resin-containing material, and a dopant.

In a further aspect, presently disclosed methods include curing the doped composite material.

According to another aspect, a method for detecting a composite material rework region on a substrate is disclosed, with the method including removing a coating from a composite substrate material to form an exposed composite material rework region, detecting a doped composite material rework region, said composite material rework region comprising a doped composite rework material, and identifying at least one identifying characteristic of the doped composite rework material.

According to a further aspect, disclosed methods further include providing a catalyst to the composite material rework region, and activating the doped composite repair material.

According to a further aspect, the identifying characteristic includes a visual characteristic that is visibly or visually detected.