sequence for topcoats which is less than optimum for flow time. Abrasion may alter the color of a basecoat even after the subsequent clearcoat is applied and sanding cannot be used on special effect paints containing micas or metallic particles.

A spray-applied chemical reactivation method has previously been described in US Patent Application 11/784534. Reactivation using this method showed improved adhesion over no reactivation and similar to mechanical abrasion, but can lose some effectiveness at lower humidity. Humidity is not economical to control due to the large volume of a paint hangar, which can exceed 10000 cubic meters, needed to hold a commercial airplane. The hangars will sometimes attempt to raise the humidity by spraying water on the floor, but this is not a robust approach and is not always sufficient so at low humidity, the conventional method for reactivating coatings is by mechanical abrasion. However, as previously mentioned, the use of mechanical abrasion is problematic for a variety of reasons including ergonomics, process flow time, appearance, and consistency.

Consequently, there is a need to extend the application window to low humidity conditions such that the number of days per year that the chemical reactivation method can be more viably used would be increased. In addition, there is a need to make chemical reactivation as robust and as durable as possible to make this process more broadly appealing for environmental conditions found globally, which is relevant for after-market, depot, rework and touch-up operations as well as non-aerospace applications.

SUMMARY

In an aspect, there is provided a method of reactivating a surface of an organic paint coating present on a substrate, the method comprising applying a surface treatment to the organic paint coating, the surface treatment consisting of a solvent, nanoparticles, optionally an additive, and a surface exchange agent selected from at least one of a titanate, zirconate and chelates thereof.

In another aspect, there is provided a method of facilitating adhesion of a coating to an organic paint coating disposed on a substrate, the method comprising applying a surface treatment to the organic paint coating to form a reactivated organic paint coating, the surface treatment consisting of a solvent, nanoparticles, optionally an additive, and a surface exchange agent selected from at least one of a titanate, zirconate and chelates thereof. The method also comprises depositing a second coating on the reactivated organic paint coating.

In a further aspect, there is provided a surface treatment formulation for reactivating a surface of an organic paint coating present on a substrate to facilitate adhesion of the organic paint coating to a further coating, the formulation consisting of:

(a) a surface exchange agent selected from titanate, zirconate, or chelates thereof;

(b) one or more organic solvents present in an amount of at least about 85 weight % based on the total weight % of the formulation;

(c) a nanoparticle;

(d) optionally an additive present in an amount of less than about 10 weight % based on the total weight of the formulation.

In an embodiment, the formulation comprises or consists of:

(a) the surface exchange or transesterification agent present in an amount of less than about 8 weight %;

(b) the solvent present in an amount of at least about 85 weight %;

(c) nanoparticles present in an amount of less than about 2 weight %; and

(d) optionally an additive present in an amount of less than about 10 weight %;

wherein the weight % of each of components (a)-(d) is based on the total weight % of the formulation and the total weight % for components (a)-(c), when an additive is not present, or the total weight % for components (a)-(d), when an additive is present, is 100.

There is also disclosed a substrate having an organic coating wherein the surface of the organic coating has been reactivated to facilitate adhesion of the coating to a further coating by applying a reactivation treatment according to the first or second aspects, or any aspect thereof as described herein, to the organic coating wherein one or more of the components of the reactivation treatment are applied simultaneously, sequentially or separately of the organic coating, or by applying a surface treatment formulation according to the third aspect, or any aspects thereof as described herein.

In an embodiment, the substrate is a substantially inelastic panel. In another embodiment, the substrate is a metal, metal alloy or composite material.

In other embodiments, the further coating may be an organic coating, such as an organic paint coating.

It will be appreciated that further aspects are described herein, which may include one or more of the features as described above.

DETAILED DESCRIPTION

Various methods have been developed by the present inventors that allow an effective reactivation of an existing organic paint coating present on a rigid substrate to be performed over a broad application window, which includes low humidity, for example below