MULTI-LAYER COATING AND RELATED METHODS OF APPLICATION

BACKGROUND

Downhole oil and gas tools are often subject to harsh, corrosive or otherwise extreme downhole environments. Accordingly, metal pre-treatments, final treatments, finishings and coatings may be applied on downhole tool surfaces as protection.

SUMMARY OF THE INVENTION

In one aspect, embodiments disclosed herein relate to a downhole tools including a circumferential band comprising a plurality of axially adjacent weld beads forming a wear resistant surface along a particular axial length of an outer surface of the tool and at least one circumferential multi-layer coating applied axially adjacent the band on either end, the coating including a first layer, exhibiting a first color, applied directly onto the tool surface, and a second wear-resistant layer, exhibiting a second color different from the first color, applied directly onto the first layer, wherein when the second layer wears or is removed by a certain amount, the first color of the first layer is revealed as an indication of the degree of wear.

In another embodiment a downhole tool is disclosed comprising a circumferential band comprising a plurality of axially adjacent weld beads forming a wear resistant surface along a particular axial length of an outer surface of the tool. The tool may have at least one circumferential multi-layer coating applied axially adjacent the band on either end. The coating comprises a first wear-resistant layer, applied directly onto the tool surface; a first color layer, exhibiting a first color, applied to said first wear-resistant layer; a second wear-resistant layer, exhibiting a second color different from the first color, applied directly onto the first color layer. When the second wear-resistant layer

wears or is removed by a certain amount, the first color of the first color layer is revealed as an indication of the degree of wear.

In other aspects, embodiments disclosed herein relate to a method of applying a multi-layer coating a portion of a circumferential wear band located along a particular axial length of an outer surface of a downhole tool, the wear band comprising a plurality of axially adjacent weld beads, the method including applying a first layer, the first layer exhibiting a first color, directly onto a surface of the downhole tool surface axially adjacent the band on either end, and applying a second wear-resistant layer, the second layer exhibiting a second color different from the first color, directly onto at least a portion of the wear band, wherein when the second layer wears or is removed by a certain amount, the first color of the first layer is revealed to indicate the degree of wear.

BRIEF DESCRIPTION OF THE FIGURES

Figure 1 illustrates one embodiment of a multi-layer coating on a downhole tool.

Figure 2 illustrates a cross-section view of multi-layer coatings on a downhole tool.

Figure 3 illustrates an embodiment using a build coat.

DETAILED DESCRIPTION

A multi-layer coating applied on various downhole tools, or any tools in any industry that may experience wear, and methods of applying the multi-layer coating on surfaces using, for example, thermal application methods such as spray, is disclosed. For example, downhole oil and gas drilling tool applications may include tools, e.g.,