Durable Retroreflective Elements with an Ionic Copolymer Core

Technical Field

The present disclosure relates to retroreflective elements with an ionic copolymer core.

Background

Pavement or road markings (*e.g.*, paints, tapes, and individually mounted articles) guide and direct motorists and pedestrians traveling along roadways and paths. Pavement or road markings can be used on, for example, roads, highways, parking lots, and recreational trails. Typically, pavement markings form stripes, bars, and markings for the delineation of lanes, crosswalks, parking spaces, symbols, legends, and the like. Paint was a preferred pavement marking for many years. Retroreflective liquid pavement markings typically include retroreflective elements. Retroreflective liquid pavement marking offer significant advantages over paint, such as increased visibility, retroreflectance, improved durability, and temporary and/or removable marking options. Such retroreflective elements are described in, for example, U.S. Patent Nos. 5,750,191; 5,774,265; 5,942,280; 7,513,941; 8,591,044; 8,591,045; and U.S. Patent Publication Nos. 2005/0100709 and 2005/0158461, all of which are incorporated herein in their entirety. Commercially available retroreflective elements include, for example, All Weather Elements made by 3M Company of St. Paul, MN. Typically, a retroreflective element includes a core adjacent to numerous glass or glass ceramic beads that are adhered to the outermost surface of the core by a binder.

As is described in, for example, U.S. Patent Publication No. 2005/0100709, the retroreflective elements are applied onto or into liquid roadway or pavement markings or compositions such that at least a portion of most of the retroreflective elements extends above or out of the roadway or pavement marking. Light that is transmitted by a light source (*e.g.*, a streetlight or a car's headlights) is incident on the retroreflective liquid pavement marking (and the retroreflective elements therein) is retroreflected by the retroreflective elements in the roadway marking. Specifically, the glass or glass ceramic beads transmit incident light back toward the incoming light source.

Pavement or road markings are subject to continuous wear and exposure to the elements as well as road chemicals. Consequently, there is a need for the materials used in pavement or road marking compositions that provide durability and retained reflectivity once applied to a surface.

Summary

The disclosed retroreflective element includes a highly durable core with an ionic copolymer. These disclosed retroreflective properties remain intact even after continued application of external forces and stresses. Further, the ionic copolymer allows for bead to be loaded into the ionic copolymer of the core, securely disposed around the perimeter of the core, or both.

In one aspect, there is provided a reflective element comprising a core comprising an ionic copolymer and a plurality of beads. In one embodiment, the core uniformly comprises an ionic copolymer. In one