

Pressure-Sensitive Adhesive Layers with Surface-Enriched Stripes And Methods of Making

Background

Pressure-sensitive adhesives (PSAs) are widely used for various bonding applications.

Summary

In broad summary, herein is disclosed an article comprising a pressure-sensitive adhesive layer on a substrate, the adhesive layer comprising stripes of first and second pressure-sensitive adhesives. The surface of the adhesive layer that faces the substrate is surface-enriched with the first pressure-sensitive adhesive. In one aspect, there is provided an article comprising a substrate comprising a first major surface; a primary adhesive layer disposed on the first major surface of the substrate, wherein the primary adhesive layer comprises a plurality of stripes of a first pressure-sensitive adhesive and of a second pressure-sensitive adhesive, arranged in a generally alternating pattern across a lateral extent of the substrate; wherein for at least for selected stripes of the first pressure-sensitive adhesive, a lateral edge portion of the first pressure-sensitive adhesive stripe inwardly underlies, and is in contact with, a lateral edge portion of a second pressure-sensitive adhesive stripe that is laterally adjacent to the first pressure-sensitive adhesive stripe, and a substrate-side lateral width of the first pressure-sensitive adhesive stripe is greater than an opposite-side lateral width of the first pressure-sensitive adhesive stripe by a factor of at least about 1.2, wherein the first pressure-sensitive adhesive is a silicone-based pressure-sensitive adhesive, the second pressure-sensitive adhesive is an organic polymeric pressure-sensitive adhesive, and the substrate is a release liner comprising a fluorosilicone release surface, and wherein the first pressure-sensitive adhesive provides an overall area fraction, on a side of the primary adhesive layer that faces the first major surface of the substrate, of less than 100 %.

Methods of making such articles are also disclosed. In another aspect, there is provided a method of making an article, the method comprising: simultaneously expelling a first precursor liquid of a first pressure-sensitive adhesive through a first set of multiple, laterally-spaced-apart openings in a coating die and simultaneously expelling a second precursor coating liquid of a second pressure-sensitive adhesive through a second set of multiple, laterally-spaced-apart openings in the same coating die, wherein the openings of the first set and the openings of the second set are arranged in a generally alternating pattern with each other so that generally-alternating streams of the first and second precursor liquids are expelled therefrom and are deposited onto a surface of a substrate that is continuously moving past the coating die; allowing, for at least selected laterally-adjacent streams of the first and second precursor liquids, a lateral edge of the deposited first precursor liquid to laterally displace a lateral edge of the deposited second precursor liquid at the surface of the substrate, and solidifying the first precursor liquid into the first pressure-sensitive adhesive and solidifying the second precursor liquid into the second pressure-sensitive adhesive, thereby forming generally alternating stripes of the first and second pressure-sensitive adhesives

on the substrate, wherein at least for selected stripes, the lateral displacing of a lateral edge of the second precursor liquid by a lateral edge of the first precursor liquid at the surface of the substrate causes a lateral edge portion of the first pressure-sensitive adhesive stripe to inwardly underlie, and to be in contact with, a lateral edge portion of a laterally-adjacent second pressure-sensitive adhesive stripe, and causes a substrate-side lateral width of the first pressure-sensitive adhesive stripe to be greater than an opposite-side lateral width of the first pressure-sensitive adhesive stripe by a factor of at least about 1.2, and wherein the first pressure-sensitive adhesive is a silicone-based pressure-sensitive adhesive, the second pressure-sensitive adhesive is an organic polymeric pressure-sensitive adhesive, and the substrate is a release liner comprising a fluorosilicone release surface.

These and other aspects of the disclosure will be apparent from the detailed description below. In no event, however, should this broad summary be construed to limit the claimable subject matter, whether such subject matter is presented in claims in the application as initially filed or in claims that are amended or otherwise presented in prosecution.

Brief Description of the Drawings

Fig. 1 is a schematic cross sectional slice view of a portion of an exemplary article as disclosed herein.

Fig. 2 is a schematic cross sectional slice view of a portion of another exemplary article as disclosed herein.

Fig. 3 is a schematic cross sectional slice view of a portion of another exemplary article as disclosed herein.

Like reference numbers in the various figures indicate like elements. Some elements may be present in identical or equivalent multiples; in such cases only one or more representative elements may be designated by a reference number but it will be understood that such reference numbers apply to all such identical elements. Unless otherwise indicated, all figures and drawings in this document are not to scale and are chosen for the purpose of illustrating different embodiments of the invention. In particular the dimensions of the various components are depicted in illustrative terms only, and no relationship between the dimensions of the various components should be inferred from the drawings, unless so indicated.

Although terms such as "top", "bottom", "upper", "lower", "under", "over", "front", "back", "up" and "down", and "first" and "second" may be used in this disclosure, it should be understood that those terms are used in their relative sense only unless otherwise noted. The terms inward, outward, and lateral have particular meanings as defined later herein. The term "adhesive" as used herein means a pressure-sensitive adhesive. As used herein as a modifier to a property or attribute, the term "generally", unless otherwise specifically defined, means that the property or attribute would be readily recognizable by a person of ordinary skill but without requiring absolute precision or a perfect match (e.g., within +/- 20 % for quantifiable properties). The term "substantially", unless otherwise specifically defined, means to a high degree of approximation (e.g., within +/- 10% for quantifiable properties) but again without

What is claimed is:

1. A method of making an article, the method comprising:

simultaneously expelling a first precursor liquid of a first pressure-sensitive adhesive through a first set of multiple, laterally-spaced-apart openings in a coating die and simultaneously expelling a second precursor coating liquid of a second pressure-sensitive adhesive through a second set of multiple, laterally-spaced-apart openings in the same coating die,

wherein the openings of the first set and the openings of the second set are arranged in a generally alternating pattern with each other so that generally-alternating streams of the first and second precursor liquids are expelled therefrom and are deposited onto a surface of a substrate that is continuously moving past the coating die;

allowing, for at least selected laterally-adjacent streams of the first and second precursor liquids, a lateral edge of the deposited first precursor liquid to laterally displace a lateral edge of the deposited second precursor liquid at the surface of the substrate,

and,

solidifying the first precursor liquid into the first pressure-sensitive adhesive and solidifying the second precursor liquid into the second pressure-sensitive adhesive, thereby forming generally alternating stripes of the first and second pressure-sensitive adhesives on the substrate,

wherein at least for selected stripes, the lateral displacing of a lateral edge of the second precursor liquid by a lateral edge of the first precursor liquid at the surface of the substrate causes a lateral edge portion of the first pressure-sensitive adhesive stripe to inwardly underlie, and to be in contact with, a lateral edge portion of a laterally-adjacent second pressure-sensitive adhesive stripe, and causes a substrate-side lateral width of the first pressure-sensitive adhesive stripe to be greater than an opposite-side lateral width of the first pressure-sensitive adhesive stripe by a factor of at least about 1.2, and,

wherein the first pressure-sensitive adhesive is a silicone-based pressure-sensitive adhesive, the second pressure-sensitive adhesive is an organic polymeric pressure-sensitive adhesive, and the substrate is a release liner comprising a fluorosilicone release surface.

2. The method of claim 1 wherein the first and second precursor liquids are first and second coating solutions.

3. The method of claim 1, wherein after the selected streams of the first precursor liquid and the second precursor liquid are deposited on the surface of the substrate and before the precursor liquids are solidified, the deposited first precursor liquid comprises a thickness that is at least about 1.4 times the thickness of the deposited second precursor liquid.

4. The method of claim 3 wherein the deposited first and second precursor liquids, prior to being solidified, are passed through a thickness-control gap that defines a distance between a thickness-control member and the surface of the substrate, which thickness-control gap is shorter in height than a thickness of the deposited first precursor liquid.

5. ~~The method of claim 1, wherein the substrate is a release liner.~~

6. ~~The method of claim 1, wherein the first pressure-sensitive adhesive is a silicone-based pressure-sensitive adhesive and wherein the second pressure-sensitive adhesive is an organic polymeric pressure-sensitive adhesive.~~

75. The method of claim 61, wherein the organic polymeric pressure-sensitive adhesive comprises an organic elastomer selected from the group consisting of styrenic block copolymer elastomers, natural rubber elastomers, (meth)acrylate elastomers, and mixtures and blends thereof.

86. The method of claim 1 wherein at least selected streams of the first precursor liquid are laterally flanked by first and second streams of the second precursor liquid, and wherein first and second lateral edges of the first precursor liquid are caused to laterally displace lateral edges of the first and second streams of the second precursor liquid at the surface of the substrate.

97. The method of claim 1, further comprising the step of contacting major surfaces of the generally alternating stripes of the first and second pressure-sensitive adhesives, which major surfaces face oppositely from the substrate, to a highly extensible tape backing and bonding the stripes of the first and second pressure-sensitive adhesive to the highly extensible tape backing to form a stretch-releasable tape article.

108. An article comprising:
a substrate comprising a first major surface;
a primary adhesive layer disposed on the first major surface of the substrate,

wherein the primary adhesive layer comprises a plurality of stripes of a first pressure-sensitive adhesive and of a second pressure-sensitive adhesive, arranged in a generally alternating pattern across a lateral extent of the substrate;

wherein for at least for selected stripes of the first pressure-sensitive adhesive,

a lateral edge portion of the first pressure-sensitive adhesive stripe inwardly underlies, and is in contact with, a lateral edge portion of a second pressure-sensitive adhesive stripe that is laterally adjacent to the first pressure-sensitive adhesive stripe, and,

a substrate-side lateral width of the first pressure-sensitive adhesive stripe is greater than an opposite-side lateral width of the first pressure-sensitive adhesive stripe by a factor of at least about 1.2,

wherein the first pressure-sensitive adhesive is a silicone-based pressure-sensitive adhesive, the second pressure-sensitive adhesive is an organic polymeric pressure-sensitive adhesive, and the substrate is a release liner comprising a fluorosilicone release surface,

and wherein the first pressure-sensitive adhesive provides an overall area fraction, on a side of the primary adhesive layer that faces the first major surface of the substrate, of less than 100 %.

~~119.~~ The article of claim ~~108~~, wherein the first pressure-sensitive adhesive stripe comprises a laterally-central portion with a second major surface that faces generally opposite the first major surface of the first pressure-sensitive adhesive stripe, which second major surface of the laterally-central portion of the first pressure-sensitive adhesive stripe is not in contact with or covered by the second pressure-sensitive adhesive stripe.

~~1210.~~ The article of claim ~~108~~, wherein the first pressure-sensitive adhesive provides a substrate-side area fraction on the substrate-facing surface of the primary adhesive layer and provides an opposite-side area fraction on the side of the primary adhesive layer that is opposite the substrate, and wherein the primary adhesive layer exhibits a first pressure-sensitive adhesive surface-enrichment factor that is the ratio of the substrate-side area fraction of the first pressure-sensitive adhesive to the opposite-side area fraction of the first pressure-sensitive adhesive,

and wherein the first pressure-sensitive adhesive surface-enrichment ratio is at least about 1.2.

~~1311~~. The article of claim ~~108~~, wherein the first pressure-sensitive adhesive provides an overall area fraction, on a side of the primary adhesive layer that is opposite the substrate, of from greater than about 20 %, to about 70 %.