Surfaces and barrier performance.

Charles A. Bishop C.A.Bishop Consulting Ltd. www.cabuk1.co.uk

Abstract

Flexible barrier materials include glass, metal foil and polymers with the flexible glass and foil being regarded as perfect barriers but high cost and polymers are lower cost but have a relatively poor barrier performance. There are many coatings and fillers that can be used to achieve suitable food packaging barrier materials but it has proven difficult to improve the polymer barrier performance the six orders of magnitude necessary to meet the barrier requirements for the flexible electronics industry. The active materials used in organic light emitting devices (OLEDs) and phtovoltaics are often very sensitive to moisture and oxygen. With many photovoltaic systems the guaranteed lifetime has to be of the order 15 – 25 years which is why the barrier performance has to be so much higher than for food packaging where the shelf life may be less than 1 year.

There has been work done to enhance the barrier performance of polymers using coatings. The vacuum coated barrier materials copy the 'perfect' barrier materials with aluminium or alumina copying the metal foil or flexible glass. The performance of these coatings has been disappointing with them only enhancing the polymer barrier performance by one to two orders of magnitude. This did prompt a large amount of work to find out why the performance was not better. Two of the largest problems to achieving a good barrier coating relate to the polymer surface. One is the material that migrates to the surface from within the bulk of the polymer and may cause adhesion problems. The second is the contamination of the surface by particulates. This paper will consider what options there are to manage the polymer surface in order to improve the barrier performance.