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New perspectives in syntheses of Al₂O₃ based transparent oxides barrier coatings

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In the early days of vacuum web coating, experiments were performed using sputtering as well as thermal evaporation with various coating sources and using multitude of coating materials. Transparent barriers for the flexible packaging of food and similar goods are judged against packaging film vacuum coated with aluminum as regards their properties and particularly their production costs. An important role has been played by development of deposition Al₂O₃ based structure, being the Alumina a material able to satisfy both the requests of low cost and good oxygen and water vapor barrier properties. In the eighties, the successful commercialization of vacuum web coating for decorative and packaging applications was a consequence of the decision to concentrate on thermal evaporation. Hence, before 1990s, virtually without exception, aluminum web coating systems all over the world were based on the same technology, the same basic design, and the same coating source, which had been specially developed the aluminum. There were no economically viable or competitive alternatives to these applications from a technical point of view.

In the nineties, therefore, the two general trends to reduce input materials cost and to facilitate packaging processes are valid for all types of packagings, also on the technical sector. For consumer packagings, a third motivation also comes from the waste management side.

In our study, to overcome these commercial and technical demands of transparent oxides barrier coatings, the syntheses Al₂O₃ of films were carried out by planar magnetron sputtering with various target power densities, films thickness, and specially oxygen partial pressure. The deposition rate, microstructure, surface morphology, chemical composition of the films were studied using a-step profilometer, X-Ray Diffraction(XRD), Scanning Electron Microscopy

(SEM), X-Ray Photoelectron Spectroscopy(XPS) respectively. In order to confirm the relationship between film properties and their functional properties, we analyzed Oxygen and Water Vapor Transmission Rate(OTR, WTR).