



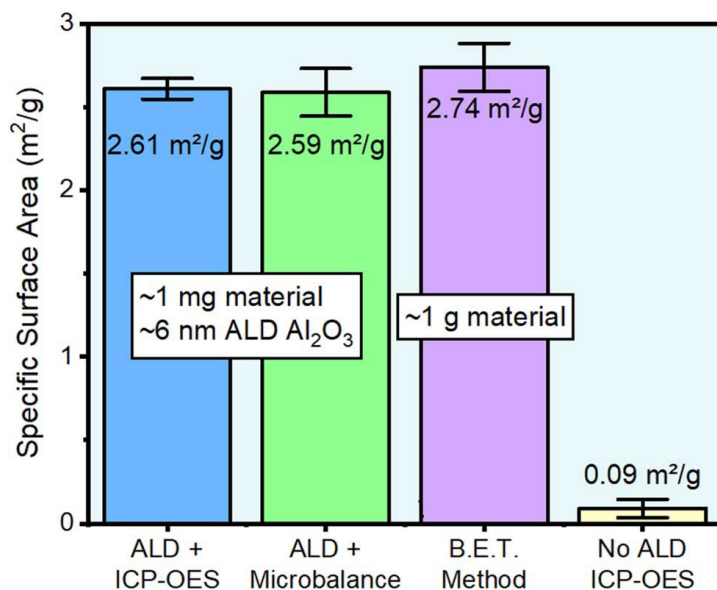
ARRADIANCE Sneak Preview

Determination of surface area by ALD

April 20, 2023

In many fields, the surface area of a material is a key parameter determining its usefulness. For instance, the performance of catalysts, battery and capacitor electrodes, concrete components, and many water filters depends on the surface area. Conventionally, the surface area of materials used for these applications has been measured by the Brunauer, Emmett and Teller (BET) method. This method measures surface area by measuring the mass gain due to adsorption of a gas molecule, typically nitrogen at liquid nitrogen temperatures. This requires costly equipment and may not be available to researchers or companies who need to measure surface area.

In [Atomic layer deposition for surface area determination of solid oxide electrodes](#), the authors, Schmauss and Barnett from Northwestern University, present a method for determining surface area by atomic layer deposition (ALD) using the Arradiance GEMStar™ ALD system. The principle of this method is simple: coat the material conformally by ALD, then measure the mass of the ALD deposited material and divided by the density and film thickness to find the surface area. They deposited Al₂O₃ on a particular solid oxide fuel cell electrode by ALD and determined the mass deposited by two methods: weighing before and after deposition, and independently by dissolving the sample and finding the aluminum mass by plasma optical emission spectroscopy (ICP-OES), arriving at essentially the same surface area value by both methods. The surface area of the electrode was also measured by the BET method, finding a similar value. However, for ALD only a milligram of the sample was needed, whereas for BET a gram was needed – one thousand times more material!



ALD now allows simple and cost-effective surface area determination. Arradiance's GEMStar™ ALD system includes features like slow pumping which enables coating of powders and other fragile, high surface area substrates. If you would like more information or wish to inquire about GEMStar™ Technology, ALD systems or Foundry services, please [Contact Arradiance](#).