Electrochemistry, Solid-State Science/Technology, and Health Care

After the powder settles down on the wintry slopes around Vancouver and the Olympic Games, the 217th ECS Meeting will roll into town in April 2010. One of the many fine symposia to be scheduled at this meeting that caught my attention was "Electrochemistry in Medicine and Biomedical Applications" (C1). This topic especially hit very close to home by a recent personal and lifestyle-altering experience I had in December 2009: a heart attack or myocardial infarction. A cardiac stent was put in my heart as a result (more on stents a little later in this column). It turns out that ECS has a long history of supporting symposia on the role of electrochemistry in biology and medicine. As far back as in 1955, a symposium on precisely this topic was held in New York and a proceedings volume grew out of the discussions at this forum. More recently, I was personally involved as a co-organizer of a symposium sponsored by the New Technology Subcommittee entitled, "Electrochemistry and Solid-State Science and Technology in the Service of Medicine" (see *Interface*, Vol. 9, No. 3, fall 2000). A quick glance through the back issues of this magazine serves to underline the many important contributions that ECS members have made in medicine and health care; this obviously includes the corporate membership also.

It is worth noting that these contributions come from all the Technical Divisions of the Society. Rather obvious candidates in this list of Divisions include Organic and Biological Electrochemistry, Battery, and Sensor. However, important biomedical advances are also accruing from membership localized, for example, in Physical & Analytical Electrochemistry and Energy Technology (*e.g.*, neurochemical imaging and biofuel cells); Corrosion (*e.g.*, biocompatibility of implant materials); and Fullerenes, Nanotubes, and Carbon Nanostructures (*e.g.*, cancer therapy and controlled drug release). Metal stents facilitate the opening of arteries and stem the adverse effects of plaque deposition on arterial walls (atherosclerosis). They represent a core business of at least one major corporate sponsor of the ECS of which I was aware. I was intrigued to learn from Mary Yess, Managing Editor of *Interface*, about an electrodeposited composite coating on nitinol stents developed by a very recent collaborator of mine in a book chapter project on electrodeposition, Mordechay Schlesinger (See *Interface*, Vol. 12, No. 3, fall 2003, p. 20). Nitinol (it is a bimetallic alloy and the acronym stands for nickel titanium naval ordinance laboratory) is a rather amazing material, but that is another story. The aforementioned coating serves multiple functions of drug release, corrosion prevention, and radio opacity; you can read about it in a column penned by another ECS member, Bob Rapp in *Materials Today* (Vol. 7, May 2004, p. 13). In my own case, the cardiologist chose to use a non-drug coated metal stent for various reasons.

The city of Bologna in Italy may justifiably be regarded as the birthplace of bioelectrochemistry. This is where Luigi Galvani did his famous experiments on the effect of static electricity on a frog's leg. This was a serendipitous discovery, as it turns out, and Galvani's investigations, we now know, led to the invention of the battery. The battery was not invented by Galvani himself but by his associate, Alessandro Volta, who (unlike Galvani) reasoned that "animal electricity" did not originate as a fluid within the frog's body. Volta's research led to an early version of the battery or a "voltaic pile." It is entirely apt that these two pioneers are now honored by the technical terms "galvanic" and "voltaic," and by the unit name for voltage (volt). Indeed, bioelectrochemistry has evolved into a powerful discipline in its own right and has spawned life-saving advances in diabetes management, therapeutic protocols/devices for treating brain disorders, and point-of-care cancer diagnostics. And I am now acutely aware (and thankful) of how far we have come in the management of heart disease and how electrochemistry and materials chemistry have contributed to these (and other) medical advances. Stay tuned.

Raj K.

Krishnan Rajeshwar
Editor

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