Preface

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The special issue of *Electrocatalysis* is dedicated to Dr. Radoslav Adzic on the occasion of his 70th birthday. Ratko, as he is known to his students, colleagues, and friends, is an outstanding, curiosity-driven and creative scientist active in the area electrochemistry and electrocatalysis. He studied at the University of Belgrade, the former Yugoslavia, and now Serbia. Following Bachelor's and Master's of Science studies, he continued his education that culminated in Doctorate of Science in 1974. The University of Belgrade was internationally renowned for its excellent training in electrochemical sciences and its electrochemists were often invited to spend time in overseas laboratories. During the time of his doctoral studies and afterwards, Dr. Adzic traveled several times to the Case Western Reserve University in Cleveland, USA, where he collaborated with the late Prof. E. Yeager. In 1992, he moved to USA and joined the Brookhaven National Laboratory where at present he is Electrochemistry Group Leader (since 2004) and Senior Chemist (since 2005). Throughout his career, he has made some 260 scientific contributions that include peer-reviewed papers, book chapters, and patents. His career-long research efforts were consistently in interfacial electrochemistry and electrocatalysis and consist of four main thrusts that are described below.

In the 1970s and 1980s, Dr. Adzic and his coworkers demonstrated that ultra-thin metallic layers prepared using the so-called under-potential deposition possess unique electrocatalytic properties towards a range of electrochemical reactions, including the formic acid and formaldehyde

oxidation, oxygen and hydrogen peroxide reduction reactions, and hydrogen evolution reaction. Several of these reactions are of great importance to the science and technology of fuel cells. Dr. Adzic and his coworkers also searched for and demonstrated the existence of structural effects in electrocatalysis using well-defined (monocrystalline) platinum electrodes. In particular, they studied the electrooxidation of formic acid, methanol, and formaldehyde using stepped single-crystal platinum electrode surfaces. This very original and meticulous research demonstrated for the first time the effect of step density and step orientation on the kinetics of formic acid and methanol oxidation.

In 1986, the first paper on hydrogen electrosorption and oxidation of formic acid on stepped single-crystal surfaces demonstrated previously unseen surface structure and anion sensitivities of these reactions. His demonstration that the surface structure can change the reaction mechanism, viz. a two-electron reduction of O₂ on Au(111) and Au(110) vs. a four-electron reduction on Au(100) was of great importance. The Au(100) surface proved to be the most active electrocatalyst for oxygen reduction in alkaline solution, even more active than platinum. In 1987, his work on oxygen electrocatalysis resulted in a general scheme for the O₂ reduction reaction, which proved very useful in explaining the most complex results obtained using a rotating disk-ring electrode.

Starting in 1992, Dr. Adzic and his collaborators made important contribution to surface electrochemistry through detailed structural studies of metallic monolayers using synchrotron radiation surface X-ray scattering techniques. Particularly interesting were pronounced effects of anion coadsorption on adlayer structures identified using surface X-ray scattering technique and its application to structural studies of electrode surfaces during the course of electrocatalytic reactions.

In 2002, building upon metal monolayer and metal adatom basic studies, Dr. Adzic and coworkers made a

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breakthrough in fuel cell electrocatalysis by demonstrating a new concept of a monolayer platinum electrocatalyst. They developed a novel Pt/Ru fuel cell carbon monoxide tolerant anode electrocatalyst for hydrogen oxidation reaction with an ultra-low platinum content. This advance was followed by the development of platinum monolayer electrocatalysts for the oxygen reduction reaction. Their original research addressed the major problem of fuel cell electrocatalysis, demonstrated the usefulness of core–shell nanoparticle catalysts, and opened up a new direction in catalysis and electrocatalysis by demonstrating unprecedented high Pt mass activity, high stability, and self-healing effect. They demonstrated the method for depositing Pt monolayer on metal nanoparticles using galvanic displacement of a Cu monolayer by a Pt monolayer. The method is scalable and it has been accepted by numerous research groups. These electrocatalysts are on the road to applications and are expected to

accelerate commercialization of fuel cells and prolong future availability of platinum and other noble metals.

The contributions of Dr. Adzic are not limited to electrochemistry and electrocatalysis because he is also a dedicated and inspiring educator. Throughout his career, he has trained numerous graduate students and postdoctoral fellows. Several of his past collaborators and group members have become highly accomplished and internationally renowned researchers occupying prominent positions in the academia, industry, and government laboratories.

Finally, it is a privilege for *Electrocatalysis* to dedicate its very first special issue to Dr. Radoslav Adzic on the occasion of his 70th birthday. It is a pleasure for the Special Issue Editor and the Editor-in-Chief to jointly manage such an endeavor. We join the contributors in expressing our respect and appreciation for Dr. Adzic and his contributions to electrochemical sciences.