Chapter 21
Nanoscience and Nanotechnology in Latin America

Adolfo Nemirovsky
LatIPnet Inc., USA

Fernando Audebert
University of Buenos Aires, Argentina

Osvaldo N. Oliveira Jr.
USP, Brazil

Carlos J. L. Constantino
UNESP, Brazil

Lorena Barrientos
Universidad Metropolitana de Ciencias de la Educación, Chile and Universidad de Chile, Chile

Guillermo González
Universidad de Chile, Chile and CEDENNA, Chile

Elder de la Rosa
Centro de Investigaciones en Óptica, México

ABSTRACT

Latin America (LA) can count some strong research centers with a tradition of research excellence in certain disciplines such as medicine and biology, nuclear technology, metallurgy and materials, among others. Latin American countries have generated networks of researchers across disciplines, centers, etc. within a country, and linking two or more countries in the region (e.g., Argentina-Brazil Bi-National Center for Nanoscience & Nanotechnology, CABN). Additionally, collaborations have extended beyond LA, mainly to the EU and the USA. In general, these programs have been quite successful in the generation of interdisciplinary nanoscience and nanotechnology (N & N) research. The relation between academia and industry has been improving in the last few years, but it is still weak. In particular, funding incentives for N&N efforts have encouraged joint efforts and contributed to new dimensions in collaborations. This chapter reviews the state of nanoscience and nanotechnology in Chile, Brazil, Argentina and Mexico.

DOI: 10.4018/978-1-61692-006-7.ch021

INTRODUCTION

This chapter provides a survey of the status of nanoscience and nanotechnology (N&N) in Latin America (LA), with special focus in the following four countries: Argentina, Brazil, Chile and Mexico. N&N has already impacted the global economy, and it appears to hold a large economic potential that is just emerging. This, in turn, is bringing together strong interest from governments, academia, industry and investors in the most developed countries and some fast growing economies (China, India, etc.). In fact, according to Lux Research (Lux 2008), global funding in N&N during 2008 reached almost $20 billion with over 40% from governments, about 40% of corporate funding, and over 5% from venture capital contribution. Products incorporating nanotech reached over $240 billion with about 65% in manufacturing and materials, 25% electronics and IT and 10% in healthcare and life sciences. Lux predicts that nanotech will touch $3.1 trillion worth of products along the value chain by 2015. Latin America contribution to total investment and N&N products has been growing but still is quite small. For example, Latin American governments' investment in N&N in 2006 reached just about $50 million (see Table 1).

N&N is a truthfully interdisciplinary endeavor that requires the collaboration of several disciplines such as physics, chemistry, mechanical and electrical engineering, biology, medicine, etc. This, in turn, has fostered partnerships among researchers and practitioner from various fields of expertise either at the same facility (university, lab, etc.) or from different institutions in academia and industry. An important byproduct of the emergence of N&N is the strong enhancement of multidisciplinary collaborations, and LA has not been an exception. In the last few years, the requirement of this field and the steering of funding agencies have fostered the development of networks of researchers from different disciplines and institutions, focused around certain topics of N&N such as optical properties of materials, characterization of materials, biosensors, etc. Some of the efforts are

Table 1. Population, income per capita, R&D and N&N expenditure, Science and Engineering (S&E) and N&N articles and patents to residents, for Argentina, Brazil, Chile and Mexico–compared against selected references

Country	Population in 2006 (millions)	2006 GNI per capita (thousands)	2006 R&D spending (as % GNP)	Government spending (millions) N&N R&D (estimated 2006)	S&E articles 2005 per million people	Nanotech publications per million people (2005)	Patents to residents per million people (2005)
Argentina	39.1	11.7	0.41	2	79.0	4.6	4
Brazil	189.3	8.7	0.98	27-40	53.1	4.7	1
Chile	16.4	11.3	0.61	10	95.6	4.5	1
Mexico	104.2	12.0	0.40	12	37.8	3.9	1
Spain	44.1	28.2	1.11	50	422.5	35.3	53
China	1,311.8	4.7	1.44	220	31.9	7.5	16
India	1,109.8	2.5	0.85	106	13.3	1.6	1
Japan	127.8	32.8	3.15	975	434.0	48.5	857
USA	299.4	44.1	2.68	1,775	692.7	47.6	244

Source: Kay L. & Shapira P. (2009)

GNI is the gross national income per capita at the Purchasing Power Parity (PPP) as defined by the World Bank. PPP exchange rates equalize purchasing power across different countries. The data has been compiled from various sources [Kay L. & Shapira P. (2009)]