# Novel process of rare-earth free magnet and thermochemical route for the fabrication of permanent magnet

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## Abstract

Rare earth (RE) - transition metal based high energy density magnets are of immense significance in various engineering applications. $Nd_2Fe_{14}B$ magnets possess the highest energy product and are widely used in whole industries. Simultaneously, composite alloys that are cheap, cost effective and strong commercially available have drawn great attention, because rare-earth metals are costly, less abundant and strategic shortage.

We designed rare-earth free alloys and fabrication process and developed novel route to prepare $Nd_2Fe_{14}B$ powders by wet process employing spray drying and reduction-diffusion (R-D) without the use of high purity metals as raw material.

MnAl-base permanent magnetic powders are potentially important material for rare-earth free magnets. We have prepared the nano-sized MnAl powders by plasma arc discharge and micron-sized MnAl powders by gas atomization. They showed good magnetic property, compared with that from conventional processes.

$Nd_2Fe_{14}B$ powders with high coercivity of more than 10 kOe were successfully synthesized by adjusting R-D step, followed by precise washing system. It is considered that this process can be applied for the recycling of RE-elements extracted from ewaste including motors.

## Biography

Febrary, 1984 : B.S. in Department of Materials Engineering, Seoul National University

Febrary, 1997 : Ph.D. in Department of Materials Engineering, Korea Advanced Institute of Science and Technology (KAIST)

March, 1986 ~ present : Director of Powder & Ceramics Division in Korea Institute of Materials Science

2004 : Visiting Scientist, Rutgers University, USA

2005 ~ 2006 : Concurrent Professor in Changwon National University

2010 ~ 2012 : Member of Review Board in Nano-convergence Organization, Korea Research Foundation

2005 ~ present : Adviser in National Nanotechnology Planning

2006 ~ present : Member of Steering Committee in Korea Nanotechnology Research Society

2009 ~ present : Member of Board of Directors in The Korean Institute of Metals and Materials

2009 ~ present : Concurrent Professor in University of Science and Technology

2013 ~ present : Member of Board of Directors in The Korean Magnetics Society

2013 ~ present : Adviser in Nano-Convergence Industry in Miryang City

## Awards

October, 2012 : Seojung Award from The Korean Institute of Metals and Materials

March, 2010 : award from Korea Research Council for Industrial Science and Technology for the 'brilliant contribution to science, technology and industry in Korea'