Professor Dr. Mohd Basyaruddin Abdul Rahman, FRSC, FASc

Name	**Haji Mohd Basyaruddin Haji Abdul Rahman**
Present Position	Senior Professor of Chemistry Deputy Dean (Research and Graduate Studies)
Office Address (permanent)	Department of Chemistry Faculty of Science, Universiti Putra Malaysia 43400 UPM Serdang, Selangor Darul Ehsan, Malaysia
Tel. No. (office)	++ 603 8946 6798 / 6603
Mobile No.	++ 6017 419 1209
E-mail	basya@upm.edu.my / basya1209@gmail.com
Field of Specialization	Catalysis Chemistry : *(Biocatalysis; Chemical Biology; Computational Chemistry)*
Affliation	Universiti Putra Malaysia (UPM) Fellow, Academy of Sciences Malaysia (ASM)

Education and Academic Qualifications

Primary School : Methodist Primary School, Parit Buntar, Perak, Malaysia (1979 - 1984)
Secondary School : Raja Tun Azlan Shah Science School, Taiping, Perak. Malaysia (1985 - 1989)
Undergraduate : Universiti Teknologi Malaysia, Johor, Malaysia (1990 - 1995)
Bachelor of Science – Double Major in Chemistry and Computer Science with Education - Second Class Upper (Hons)
Postgraduate : University of Southampton, England (1995 -1999)
Doctor of Philosophy in Catalysis Chemistry
Postdoctoral : University of Edinburgh, Scotland (2006 -2007)
Post-Doctoral in Genetic Engineering
Sponsored by Islamic Development Bank Merit Fellowship

Research Activities

Research interest encompasses a broad area from chemistry to structural biology involving biocatalysis, protein engineering and molecular simulation. Deep interests include designing

novel semisynthetic metalloenzymes and nanobiomaterials as industrial biocatalysts for various chemical reactions, emphasising in pharmaceuticals, oleochemicals and petrochemicals industries. In addition, alternative biosolvent engineering for green and environmental benign processes also investigated.

Major focus of discovery in fundamental research is the structural prediction and modification of protein and peptide structure and its function. These involve rational design and synthetic biology approaches. Furthermore, behavioural study on molecular dynamics and biomolecular interaction at the atomic level by molecular modeling and simulation are also under great interests. Nanomolecular technology, in particular nanodelivery of drugs and biomolecules using nanoemulsion and metal organic frameworks (MOF) also being developed. Aerosolised nanoemulsions for hydrophilic and hydrophobic drugs are formulated for the lung and oral cancers. New and modified MOFs also used as support for controlled release nanodelivery and as catalysis for organic reactions.

Current research and development in the laboratory;

- Aerosolised Nanoemulsion for Pulmonary Drug Delivery
- MOFs as Platform of Nanodelivery and Encapsulation of Biomolecules
- Designer Biocatalysts – Enzyme and Peptide Catalysts
- Antifreeze Peptides for Cryopreservation
- Immobilisation of Enzyme on Advanced Nanomaterials
- Chiral Esterification of Oleochemicals and Pharmaceuticals
- Structural Biology and Dynamics of Proteins and Peptides
- Metalloenzymes and Metallomics
- Ionic Liquid and Biosolvent Engineering
- Self-assembly and Nanodelivery Simulation

Research Achievements

More than 50 research projects with grants from Malaysia and international bodies, including several 'top down' national projects funded under Priority Research and Strategic Research are under Professor Basyaruddin's leadership. A fundamental project based on novel metalloenzymes was sponsored by several research grants, namely the *Academy of Sciences for Developing World* (TWAS Research Grant), the *British Council* (PMI 2 – Connect Award), *Academy of Sciences Malaysia* (SAGA Fund), the *Ministry of Science, Technology and Innovation* (Science Fund), the *National Biotechnology Directorate* (BIOTEK Fund), the *Genetics and Molecular Biology Initiatives* (GMBI Fund) and the *Ministry of Higher Education* (NanoMITE and Fundamental Research). Overall, he has secured a total of more than RM 25 million to conduct research. He has supervised and co-supervised more than 50 PhD and 50 MSc postgraduate students (including international students), in addition to more than 100 B.Sc final year projects.

He received the Japanese Society for the Promotion of Science Fellowship Award (Osaka, 2000) to acquire knowledge in microbiology. He was conferred the Young Scholar Award from the *American Chemical Society* (Hawaii, 2005) for his work in immobilised enzymes and the Young Chemists Award by *International Union of Pure and Applied Chemistry* (Torino, 2007) for his work in protein flexibility and unfolding simulations. He received the prestigious Engineering Conferences International Fellowship to attend *Enzyme Engineering XIX 2007* in Canada. For his outstanding research, he was awarded the Malaysia Excellent Scientist 2005, Young Researcher Award 2006 and Top Research Scientists Malaysia 2012. In June 2006, the Academy of Sciences

Malaysia selected him as an Outstanding Malaysian Young Scientist. Lindau Nobel Council sponsored his attendance at the *56th Lindau Meeting of Nobel Laureates with Young Scientists* in 2006. Later that year, he received the prestigious Islamic Development Bank Merit Fellowship for *Post Doctoral research in Genetic Engineering* at the University of Edinburgh, United Kingdom (September 2006), under the supervision of Professor Malcolm Walkinshaw.

On the international stage, he has made tremendous contributions to groundbreaking work and continues to collaborate with major world renowned laboratories such as University of California, Berkeley, USA (Professor Omar Yaghi – metal organic frameworks); Harvard University, USA (Professor Joseph Brain – lung cancer); University of Minnesota, USA (Professor Romas Kazlauskas – enzyme engineering); University of North Carolina at Charlotte, USA (Professor Donald Jacobs – biophysics); Texas A & M University at Commerce, Texas, USA (Professor Allan Headley – chiral catalysts); QUILL, Belfast (Professor Kenneth Seddon – ionic liquids) and GREENCHEM, Lund University, Sweden (Professor Rajni Hatti-Kaul – biocatalysis).

He also has received recognition for his expertise in metal catalytic systems especially in homogeneous reactions, with a particular focus on petrochemicals. His work in biocatalysis (liquid wax esters) and structural biology has been published (more than 180 cited and indexed papers and 12 chapters in books) in high impact journals including the *PlosOne, Journal of Molecular Catalysis B: Enzymatic, Catalysis Today, Chemical Physics, Protein Journal, Molecular Simulation, Food Chemistry, etc.* These papers are regularly cited in refereed international journals. He has presented his findings as the keynote/plenary speaker at international and local conferences (more than 300 papers). His expertise is recognised internationally as Editorial Board and he is regularly invited as a reviewer. The mass media (radio, television and magazines) regularly interviews him for his contributions.

Research Impact on IDB member countries

Dr. Mohd Basyaruddin is a true multidisciplinary scientist; his interests encompass broad areas from the single atom to complex biomacromolecules. He is among the pioneer chemists in this country who synergises experimental results with theoretical insights. His works on novel metalloenzymes and nanobiomaterials as industrial biocatalysts for various specialty chemical reactions (with emphasis on pharmaceuticals, oleochemicals and petrochemicals) could rise the impact to other IDB member countries. His extensive research in enzyme technology for the production of immobilised enzymes, *Chirazim* and *MBzyme* (supports developed from natural materials and nanomaterials) aims to provide better alternatives to existing enzymes. The sustainable production of high-yield and high-purity palm-based esters and epoxides, adipate esters and sugar esters products extend to bioreactors and statistical industry. Applications of liquid wax esters via environmentally benign processes have been extended to meet consumer needs such as in the production of *MBAdipate* (fine chemicals; lubricants), *MBiocoatings* (wood and surface coatings) and *MBSofax* (cosmecueticals; pharmaceuticals).

Recent findings in peptide chemistry for example the antifreeze peptides and metallopeptides also has many potentials in food and biomedical industries. Additionally, he is investigating alternative solvent engineering for green processes, particularly chiral ionic liquids. Recently he is involved in the aerosolized nanoemulsion for pulmonary drug delivery for smoking related diseases, especially for lung cancer.

His products showed better performance in comparison with other commercial products and published data in terms of simplicity, cost effectiveness and sustainable impact. These products have won numerous prestigious awards (more than 100, including 20 Gold medals) from international (Geneva, Pittsburgh, ITEX) and local exhibitions of product innovations including

National Intellectual Property Award 2009. His research team is actively involved in protecting their method of production and research products. To date, 20 patent applications have been granted/filed in Malaysia, 6 internationally (USA, Europe, Japan, Singapore and Indonesia) and 2 for trademarks. In 2017, he has geared his work towards industrial processing and pre-commercialisation of bio-based productions. These products and technologies could also be applied and commercialized in IDB member countries.

Impact of IDB Fellowship

After his postdoctoral tenure under IDB Merit Scholarship in 2007, he has been instrumental in establishing theoretical and computational chemistry as a major field of study in Malaysia and also being appointed in several high ranking positions. His promotion to Professorship at the age of 36 made him among the youngest in Malaysia. With such a strong academic and technical background, he has shown his ability to contribute effectively. He played a pivotal role with utmost zeal as Lead Auditor and Head of the Implementation Committee in the development of ISO 9001:2000 procedures for MS ISO certification in UPM. He was the Head of Department of Chemistry (2007-2008), the Director of Structural and Synthetic Biology Research Centre, Malaysia Genome Institute (2008-2013) and currently served as Deputy Dean (Research and Graduate Studies) (2014-2017) in the Faculty of Science, UPM. For his outstanding service at the university, he received numerous personal awards including Excellent Service Award (2004, 2013), Certificates of Excellent Service (more than 90% for 2003, 2005, 2006, 2007, 2008, 2014, 2015, 2016) and the Most Popular Lecturer (Chemistry) (2007). He was The Outstanding Young Malaysian 2008; and named as one of the Young Scientists of Asia 2009 and Young Scientists of World Economic Forum 2009 and Faces of Science@ Malaysia for his extraordinary contribution to the scientific and technological development in the country.

He energetically participates as a member of various committees for international and national conferences and workshops in the capacity of Chairman, Secretary and/or Chairperson of Sessions. He is the *Foundation Member* of the elite Global Young Academy under the umbrella of UNESCO and InterAcademy Panel (National Science Academies). He was appointed as an Associate Fellow of ASM 2010 and Founding Chairman of Young Scientists Network 2012 to cater to the needs of young talents. This appointment enables him to play a more significant role in the country, contributing his ideas and knowledge in meetings and discussions, and exhibiting his organisational ability and leadership skills. Recently, he was conferred as Fellow of Academy of Sciences Malaysia 2015 and Fellow of Royal Society of Chemistry 2016.

Additional information

Supervising postgraduates and undergraduates and enhancing their laboratory skills, and his passion for teaching and educating them comes naturally. Being raised in a teacher's family, the young and vibrant Basyar enjoys being with students and students enjoy meeting him for counselling, motivation or just talking about life and activities. He teaches inorganic, physical chemistry, petroleum chemistry and computational chemistry. His passion and vision for the youths has lead him to be active in outreach activities, especially as the Director for *MyBiotech@School* (promotion of biotechnology), *Back to Schools* (motivation and innovation in science), *National Science Challenges* and many other science motivational talks where he always emphasises the importance of chemistry, physics and mathematics in biotechnology-based knowledge and industry.

He also volunteers in public schools by advising and mentoring many science and innovation project teams, especially with his previous school, SERATAS. He received SERATAS Alumni Award

2010 and Outstanding Alumni Award 2013 for his contribution to the school and lifetime achievements. As a facilitator and motivator, he has interacted with more than 50,000 students (age 14-18) from more than 2,000 schools and matriculation centres since 2001. Currently, he actively engaged with the National STEM Movement to increase the science literacy and nurture the young talents to undertake science. He also acted as the Head of National Media Centre to encourage science journalism and communication in the country.

Professor Dr. Mohd Basyaruddin has shown tremendous progress, breaking classical barriers and has become an energetic researcher who is fully committed to the advancement of science and technology in Malaysia, particularly multidisciplinary biotechnology. He is an individual who has not only proven his ability to "wear many hats," but he wears them equally well. His success has been inspirational to his peers and to the scientific community at large. His accomplishments make him a role model that should inspire many to follow the path he has set.