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Nanoscale Horizons Emerging Investigator Series: Dr Fangfang Cao, Beihang University, China

Our Emerging Investigator Series features exceptional work by early-career nanoscience and nanotechnology researchers. Read Fangfang Cao's Emerging Investigator Series article 'MOF-derived nanozymes loaded with botanicals as multifunctional nanoantibiotics for synergistic treatment of intracellular antibiotic-resistant bacterial infection' (<https://doi.org/10.1039/D5NH00137D>) and read more about her in the interview below.



Dr Fangfang Cao is a professor at the School of Engineering Medicine, Beihang University. She received her PhD in inorganic chemistry from Changchun Institute of Applied Chemistry, Chinese Academy of Sciences, in 2019 under the supervision of Prof. Jinsong Ren and Prof. Xiaogang Qu, and later conducted postdoctoral research at the National University of Singapore under the mentorship of Prof. Xiaoyuan Chen. Dr Cao's research centres on cell and microbial therapies for translational medicine, as well as nanocatalytic medicine based on artificial enzymes, bioorthogonal and plasma catalysis, and piezoelectric materials. Her pioneering work on constructing "nanozyme-probiotic hybrids" to improve intestinal disease therapy led to her selection for the 2024 MIT Technology Review Innovators Under 35

China (TR35). She currently serves as a Community Board Member of *Nanoscale Horizons*.

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NH: Your recent *Nanoscale Horizons* Communication reports MOF-derived nanozymes for synergistic treatment of intracellular antibiotic-resistant bacterial infection. How has your research evolved from your first article to this most recent article and where do you see your research going in future?

FC: My first paper was published in *Chemical Communications* in March 2016, when I was still a second-year graduate student. At that time, my research focused on fabricating DNA-based nanoparticles for biosensing applications, which first introduced me to the exciting intersection of nanotechnology and biology. Over the years, my research has evolved from studying synthetic nanomaterials such as nanozymes to creating hybrid living materials that combine probiotics, bacteriophages, and immune cells with nanoparticles.

Looking ahead, I plan to continue exploring how nanotechnology can be used to regulate the metabolism of cells or microorganisms, overcoming challenges such as their low survival rates and limited therapeutic efficacy in disease treatment and prevention, with the ultimate goal of promoting clinical translation.

NH: How do you feel about *Nanoscale Horizons* as a place to publish research on this topic?

FC: *Nanoscale Horizons* provides an excellent platform for our research on nanozyme synthesis and biomedical applications. Its focus on cutting-edge nanoscale science aligns well with our work and ensures our findings reach a broad audience across both academia and industry.

NH: What aspect of your work are you most excited about at the moment?

FC: I'm particularly excited about scaling up the production of functional nanomaterials and exploring how their safety and stability can be harnessed to advance the translational applications of cell- and microbe-based therapies.

NH: In your opinion, what are the most important questions to be asked/answered in this field of research?

FC: Key questions include how to ensure the biosafety, reproducibility, and scalable production of nanomaterials, and, most importantly, how to bridge the gap between

fundamental research and real-world applications.

NH: What do you find most challenging about your research?

FC: As an interdisciplinary field that spans chemistry, biology, and medicine, it can be challenging to maintain a deep understanding across these areas. It requires constant reading, thinking, and active collaboration with experts from different backgrounds. On a more

practical level, guiding students through experimental challenges and ensuring that we address problems efficiently and creatively is also a daily, but rewarding, part of the process.

NH: How do you spend your spare time?

FC: I enjoy spending time with my family—going out, shopping, or traveling together. My family provides strong support for my research, and I believe maintaining balance between work and life is

essential. Relaxation and inspiration often go hand in hand!

NH: Can you share one piece of career-related advice or wisdom with other early-career scientists?

FC: Don't fear failure or complexity. When facing challenges, stay calm and systematic—review your experiments, analyze your data, and read deeply. The solution often emerges through persistence and careful thinking.