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Effect of Dispersed Magnetic Nanoparticle on the Permeability of Magnetic Toroid

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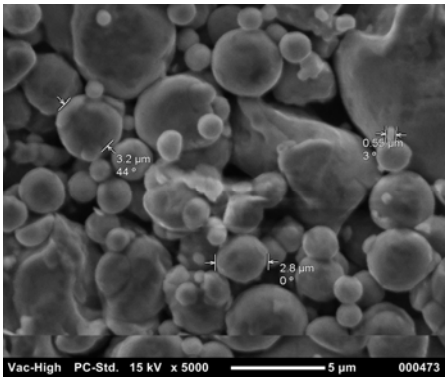
Abstract

Magnetic toroids are widely used in industry as transformers and inductors for power conversion circuits. By increasing the magnetic permeability of a toroid it can support a larger magnetic field. In turn, toroid component can be made smaller and easier to integrate into a circuit. Permeability, which is also referred to as effective permeability, depends on all substances within the toroid. Traditional toroids only have permalloy powder or ferrite and the non-magnetic binder system. When magnetic flux is flowing through the toroid, it needs to flow through many gaps, which is consisted of polymer, between powders and this significantly drops the effective permeability. The focus of this project is to determine whether or not magnetic nanoparticle can increase the permeability of traditional toroid by dispersing these nanoparticle into the binder system.



SEM image of a magnetic toroid core consisted of micron size powders and polymer binder

Biography

Junjie Liang is currently a Master of Engineering student in Dr. G.Q. Lu's group. Junjie graduated from MSE, Virginia Tech with a B.S. degree in May 2018. He started his master program in 2018 Fall and thanks to the accelerated program he finished in senior year, Junjie is expected to graduate in May 2019. His research focus on improving performance of magnetic toroid cores by increasing permeability and lowering the core loss.