



Anamolous Meissner Effect in MXene

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Abstract:

The Meissner effect in two-dimensional Nb₂C MXene is reported. The c-lattice parameter increased from 13.83 Å to 22.72 Å after chemical treatment and surface morphology shows 2D layered structure. Due to the powder form of our sample, transport properties were not measured despite several efforts made which left the sample grains discontinuous for measurement. The peculiar magnetic properties of our sample indicate clearly the existence of Meissner effect. Fittings of experimentally obtained lower critical field H_{c1} and upper critical field H_{c2} as a function of temperature to the Ginzburg-Landau (GL) theory confirms possibility of presence of type-II superconductivity in our Nb₂C samples. This peculiar magnetic behavior observed in as-synthesized Nb₂C MXene in powder form is intrinsic property of our sample. It is to be noted that we have tried to measure the transport properties of our sample but due to its powdered nature, this was not possible. It is worth paying attention that, to our knowledge, this is the first study on the as-prepared MXene (Nb₂C-powder in present case) which shows this unique Meissner effect with highest onset critical temperature (12.5 K) reported for MXene family. Although showing only signatures of localized SC, this work would stimulate future studies to confirm existence of superconductivity by measuring transport properties after fabricating fine 2D Nb₂C MXene using novel deposition techniques. We insist that this work is a significant advancement in the field of magnetism and superconductivity in 2D MXene which may be explored further to determine superconductivity by measuring the transport properties in future. . We believe this work is a significant development to explore the physical properties exhibited by 2D materials particularly the MXenes which offer unique potential for future applications.

Biography:

Syed Rizwan is currently working as Associate Professor in the Dept. Science National University of Sciences and Technology he is interested in the research field of Meissner effect in two-dimensional Nb₂C MXene.

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