2023 Departmental Poster Competition

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Doping dependence of optical conductivity of Nb(x)V(1-x)O2 single crystals at the phase transition

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Content :

Vanadium dioxide (VO2) is famous for the reversible metal-to-insulator transition - from an insulating monoclinic phase to a metallic rutile phase - slightly above room temperature which allows many photonics applications such as optical switching and modulators. Since the metal-to-insulator transition temperature is sensitive to the concentration of substituents, lower or higher the transition temperature by doping chemical substitution expands VO2 application to the lower energy scale. Here, we investigate an optical property of NbxV1-xO2 single crystals (x = 0.4, 0.11, 0.15, 0.24, 0.35, and 0.88) across the metal-to-insulator transition. NbxV1-xO2 alloy will help in resolving the structural and electronic connection among crystal phases. We measured a reflection spectrum at mid-infrared range. We obtained an optical conductivity of NbxV1-xO2 extracted by using Kramers-Kronig analysis. To evaluate the metal-to-insulator or the metal-to-semiconductor transition, we applied an extended Drude model to fit the optical conductivity.

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