

Abstract

This work is divided into two part. In the first part, we have used a liquid exfoliation method to produce quasi two-dimensional (2D) flakes of Kitaev magnets Na_2IrO_3 , $(\text{Na}_{0.85}\text{Li}_{0.15})_2\text{IrO}_3$ and $\alpha\text{-RuCl}_3$. For this work, existing crystals of Na_2IrO_3 and $(\text{Na}_{0.85}\text{Li}_{0.15})_2\text{IrO}_3$ were used and new crystals of $\alpha\text{-RuCl}_3$ were grown. By ultrasonic shaking of these crystals in an LiOH solution in ethanol, we were able to separate them into 2D sheets which are 1-3 μm wide and down to 2 nm thick. SEM and AFM characterization, and thickness distribution of these flakes with varying ultrasonic shaking time on these flakes are reported.

In the second part, crystals of $\alpha\text{-RuCl}_{3-x}\text{Br}_x$ and $\alpha\text{-RuCl}_3$ have been synthesized using a self-flux growth method. A thorough chemical and structural characterization of these crystals have been carried out by SEM, EDX and Raman spectroscopy techniques. Magnetization measurements have been performed to probe the magnetic ground state of these crystals. We have observed magnetic transition at $T_N = 8\text{ K}$, 12 K in 4% Br substituted (sheet) and 8% Br substituted (needle) crystals respectively, indicating that the magnetic order of parent $\alpha\text{-RuCl}_3$ survives on Br substitution.