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## Synthesis, characterization and magnetic ordering of the semiconducting intermetallic compound FeGa<sub>3</sub>

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# Abstract content <br> &nbsp; (Max 300 words)<br><a href="http://events.saip.org.za/getFile.py/starget="\_blank">Formatting &<br>Special chars</a>

Intermetallic compounds which are formed by good conductive metals are usually metallic. However, FeGa<sub>3</sub> was found to be a semiconductor with a narrow gap measured to be between 0.2 and 0.46 eV [1,2,3]. This gap mainly arises from the hybridization between the Ga 4<i>p</i> and Fe 3<i>d</i> bands [4]. The band-gap has been established experimentally by various techniques [4,5], and its origin verified by density functional theory (DFT) calculations [2,5].

FeGa<sub>3</sub> crystallizes in the tetragonal space group P4<sub>2</sub>/<i>mnm</i> (No. 136) [3]. The magnetism in this compound has not yet been observed, with various magnetization and specific heat measurements suggesting that it does not occur down to very low temperatures [4,6]. Recent work has also shown that the effect of the chemical doping on single crystal FeGa<sub>3</sub> creates a spin 1/2 local moment and drives the compound to become metallic [7]. Mössbauer spectroscopy (MES) has shown the absence of an internal magnetic field at the site of Fe confirming that no ordering above room temperature occurs [3]. FeGa<sub>3</sub> has recently been predicted to become metallic under pressure [1].

We will report on the preliminary results for this project. In particular, we will show how FeGa<sub>3</sub> single crystals has been synthesized by the self flux method, and then characterized by means of x-ray diffraction, energy dispersive analysis and MES. Furthermore, our measurements of the magnetic state of FeGa<sub>3</sub> as a function of temperature using MES will provide insights not previously reported. Our planned measurements as a function of pressure to search for a proposed metal-insulator transition will also be discussed.

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Yes

#### Level for award<br>%nbsp;(Hons, MSc, <br> &nbsp; PhD)?

MSc

#### Main supervisor (name and email)<br>and his / her institution

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#### Would you like to <br>> submit a short paper <br>> for the Conference <br>> Proceedings (Yes / No)?

Yes

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