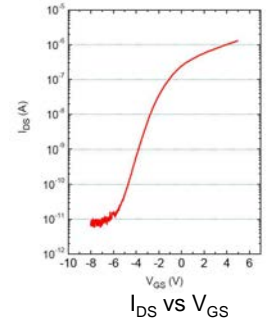
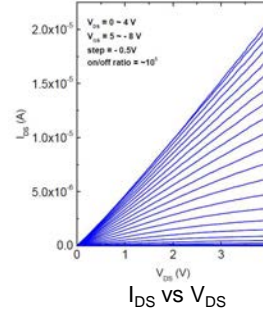
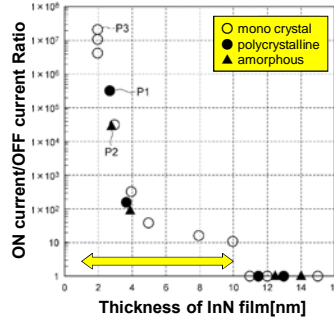
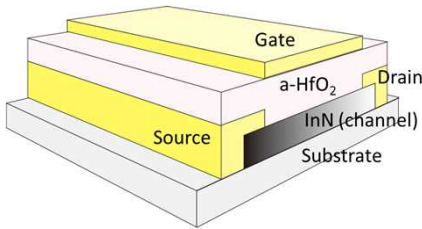


## 1. Abstract

- A transistor having an InGaAlN-based nitride semiconductor layer as a channel is newly invented.
- Even though the film is polycrystalline or amorphous, electrical properties are equivalent to those of a monocrystalline film, in case they are designed in the range of suitable composition ratio of InGaAlN.

## 2. FET Having Thin Film of InN as a Channel

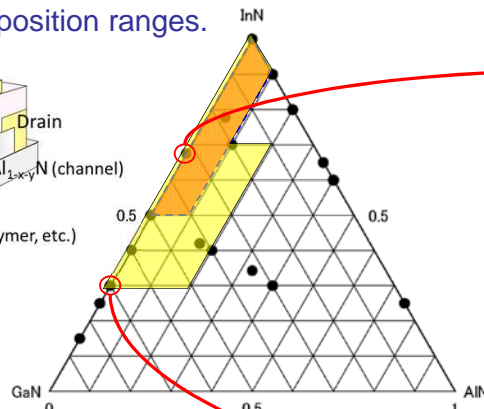
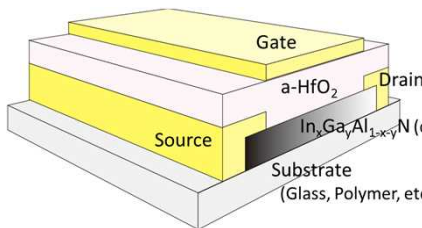
- The InN-based nitride semiconductor layer is a polycrystalline or amorphous film having a film thickness of 1-10nm. The InN layer having a film thickness within the range exhibits electrical characteristics equivalent to those of monocrystalline film, even if the layer is polycrystalline or amorphous film.



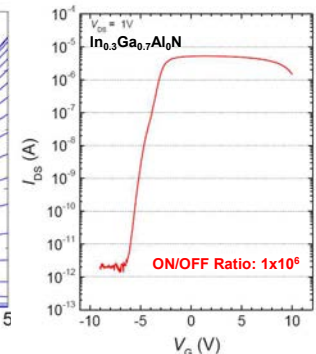
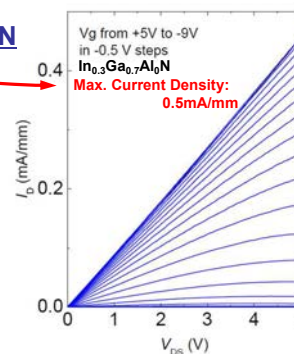
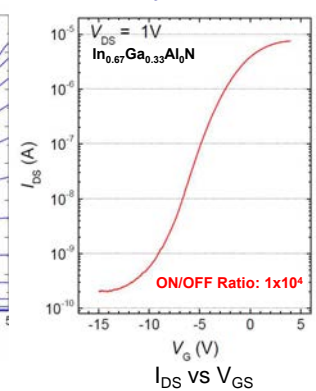
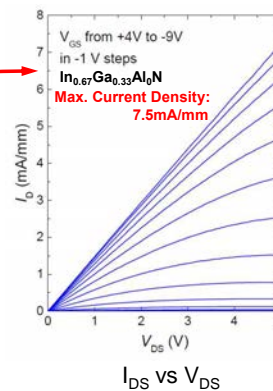
Characteristics of a TFT Consisting of Polycrystalline InN Layer

## 3. InGaAlN-based Nitride Semiconductor

- We have found out that polycrystalline or amorphous InGaAlN-based nitride semiconductors, which consist of non-mono-crystalline films, have the same electrical characteristics as the case of a monocrystalline film under the specific composition ranges.



3-phase composition diagram of In<sub>x</sub>Ga<sub>y</sub>Al<sub>1-x-y</sub>N



Characteristics of TFTs Consisting of Polycrystalline In<sub>x</sub>Ga<sub>y</sub>Al<sub>1-x-y</sub>N Layer (examples)

Tried TFTs with InGaAlN-based nitride semiconductor layer:  
 -The layer is formed by PSD(Pulsed Sputtering Deposition).  
 -The deposition temperature is lower than 600°C.  
 -The layer consists of polycrystalline or amorphous film.

→ Good result of ON/OFF current ratio was obtained within the specific composition ranges of In<sub>x</sub>Ga<sub>y</sub>Al<sub>1-x-y</sub>N (x+y=1.0).

These results indicate :

- Constraints in manufacturing conditions are significantly resolved.
- Excellent electrical characteristics are provided at a reduced cost.

## Patent Licensing Available

Patent : WO2015/029434, WO2015/029435

JST/ IP Licensing Group

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