

# FANCY MASTERARBEIT OF DEATH

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# 1 INTRODUCTION



## 2 PHYSICAL PROPERTIES OF TRANSITION METAL DICHALCOGENIDE MONOLAYERS

### 2.1 CRYSTAL STRUCTURE AND SYMMETRIES

### 2.2 ELECTRONIC BANDSTRUCTURE AND SPIN ORBIT COUPLING

### 2.3 EXCITONS IN TMDS

#### 2.3.1 BINDING ENERGY

#### 2.3.2 PHONONS AND DARK STATES

#### 2.3.3 TRIONS

### 2.4 THE VALLEY ZEEMAN EFFECT

### 2.5 BILAYER WSe<sub>2</sub>





## 3 FABRICATION OF FIELD EFFECT STRUCTURES

### 3.1 MECHANICAL EXOLIATION

#### 3.1.1 LAYER NUMBER

### 3.2 HEXAGONAL BORON NITIDE

### 3.3 ELECTRODE FABRICATION

#### 3.3.1 UV LITHOGRAPHY

#### 3.3.2 BACKGATE AND CONTACTING

### 3.4 HOT PICKUP AND STAMPING

### 3.5 ANNEALING



## 4 EXPERIMENTAL METHODS AND RESULTS

### 4.1 OPTICAL SETUP

#### 4.1.1 PHOTOLUMINESCENCE SPECTROSCOPY

#### 4.1.2 ABSORPTION SPECTROSCOPY

### 4.2 SAMPLE CHARACTERIZATION

#### 4.2.1 ELECTRICAL PROPERTIES

#### 4.2.2 NARROW LINEWIDTH

### 4.3 GATE SWEEP IN MAGNETIC FIELD # FULL CONTROL

#### 4.3.1 DOPING REGIMES

#### 4.3.2 G-FACTORS



# **Appendices**



## A LINESHAPES AND FITTING PROCEDURES

### A.1 ASYMMETRIC LORENTZIAN

### A.2 FANO RESONANCE LINESHAPE