20th Brazilian Workshop on Semiconductor Physics

# Natural 2D Insulating Materials in van der Waals Heterostructures: an Experimental and Theoretical study

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## Abstract

Naturally occurring van der Waals crystals have brought unprecedented interest to nanomaterial researchers in recent years. So far, more than 1800 layered materials (LMs) have been identified but only a few insulating and naturally occurring LMs were deeply investigated [1,2]. Thus, as soon as a new LM is identified, the investigation of its optical, mechanical, and electrical properties is promptly examined. Moreover, with the advent of techniques able to stack LMs precisely one on top of another creating the so-called van der Waals heterostructures (vdWHs) [3], new applications and studies are envisioned. Consequently, individual LMs and their vdWHs are often considered building blocks for future optoelectronic devices. Here, I will present a high throughput characterization of some naturally occurring LMs found in Brazilian mines by employing several experimental techniques and will demonstrate that these LMs can be mechanically exfoliated down to their monolayer limit. I will then corroborate the major findings with first-principles calculations, as well as demonstrate their use in vdWHs for optoelectronic devices [4-6]. Our studies show that naturally occurring LMs should be regarded as good and interesting candidates as substrates for LM-based applications.

Acknowledgments: Fundo Mackenzie de Pesquisa e Inovação, CAPES, CNPq, and FAPESP.

## References

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