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2D materials: from safety to immune-engineering

Two dimensional materials such as graphene and Mxenes are destined to leave an indelible mark in many application areas including biomedicine. In particular, due to a multitude of exceptional intrinsic properties, these materials offer new perspectives for the development of advanced tools for therapeutic delivery approaches, imaging, cancer theranostics, and tissue regeneration or engineering.

For any biomedical applications, the immune system plays a fundamental role. Understanding whether and how immune cells respond to nanomaterials by immune activation or immunosuppression might allow taking advantage of both of those selected intrinsic immune properties. For example, immuneactivation could be useful to stimulate the immune system against malignant cells in cancer immunotherapy or as vaccine adjuvants. On the other hand, immunosuppression may find applications for overactive inflammation in allergic reactions, chronic inflammation, autoimmune disorders, and organ transplantation. Here we present our “Nanoimmunity-by-design concepts” (figure 1.) as well as published and unpublished data on the immune-based applications of graphene, Mxenes and other advanced 2D materials.

References

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Figures

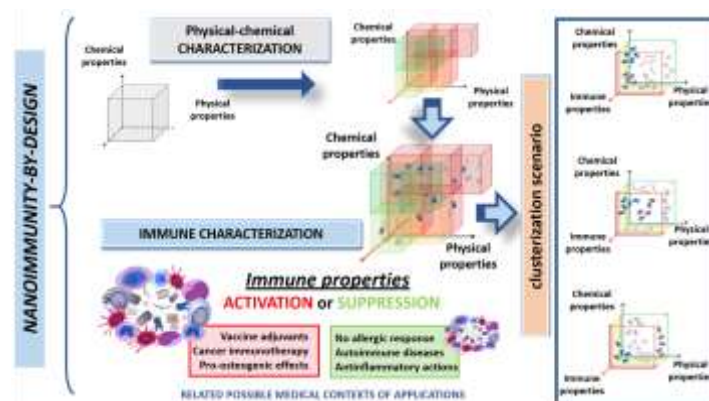


Figure 1: Schematic representation of the Nano-immunity-by design concept