The intersection between chemical and biomedical engineering: green technologies towards the development of enhanced biomaterials

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Despite the advances on biomaterials development and polymer processing technologies, this remains still one of the major scientific challenges that tissue engineering and regenerative medicine (TERM) faces to go from benchtop to bedside. Ideal scaffolds should be biocompatible, biodegradable and promote cellular interactions and tissue development and possess proper mechanical and physical properties. The preparation of 3D matrices must result, hereafter in structures with adequate porosity, interconnectivity, pore size distribution and compression properties which make then suitable for the tissue to be engineered. A wide range of biomaterials has been proposed for biomedical applications, from metals to ceramics and polymers. Due to their versatility, polymers are the straightforward choice. These must comply with different requirements such as hydrophilicity, biocompatibility, degradation rate, citotoxicity, among others. The use of natural based polymers in tissue engineering and regenerative medicine applications has long been proposed, precisely due to their chemical/biological versatility. Nonetheless, its processing using supercritical fluids only recently has started to received more attention from researchers. Supercritical fluids appear as an interesting alternative to the conventional methods for processing biopolymers as they do not require the use of large amounts of organic solvents and the processes can be conducted at mild temperatures. Different processing methods based on the use of supercritical carbon dioxide have been proposed for the creation of novel architectures able to fulfill the particular needs of each tissue to be regenerated and these will be unleashed in this presentation.