Angers, le 2 novembre 2026

AVIS DE SOUTENANCE DE THÈSE

DOCTORAT (Arrêté du 26 août 2022 modifiant l'arrêté du 25 mai 2016)

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candidate au diplôme de Doctorat de l'Université d'Angers, est autorisée à soutenir publiquement sa thèse

le 26/11/2026 à 14h30

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sur le sujet suivant :

Development of conductive biomaterial to investigate its effect on the excitable properties of cells

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Résumé de la thèse

Regenerative medicine and tissue engineering increasingly rely on advanced biomaterials capable of supporting tissue regeneration while actively interacting with cells. Among these, conductive biomaterials have attracted considerable attention because of their ability to mimic the electrical microenvironment of native excitable tissues and modulate cellular electrophysiological behaviour. The aim of this dissertation was to develop novel conductive biomaterials, characterize their physicochemical properties, and evaluate their biological performance with particular emphasis on their effects on cellular electrophysiology. Two different conductive biomaterial systems were mainly investigated. The first was based on the incorporation of expandable graphite (EG) into a polymer matrix to fabricate conductive porous scaffolds using a simple and cost-effective preparation strategy. The second consisted of polypyrrole and chitosan (PPy_CH) composites prepared as stable colloids and subsequently processed into conductive thin films. The EG scaffolds exhibited suitable electrical conductivity, appropriate porosity, and sufficient mechanical stability while maintaining good cytocompatibility with NIH/3T3, ES R1, and AC16 cell lines. The PPy_CH colloids and conductive films also demonstrated excellent cytocompatibility in NIH/3T3, ES R1, and GH3b6 cells. Electrophysiological analyses using the patch-clamp technique revealed that conductive PPy_CH films modulated ionic currents in GH3b6 and H9c2 cells. However, no significant changes were detected in membrane capacitance or in the expression of selected ion channel–encoding genes. Furthermore, the conductive films supported embryoid body attachment and the differentiation of ES R1 cells into cardiomyocyte-like cells.