

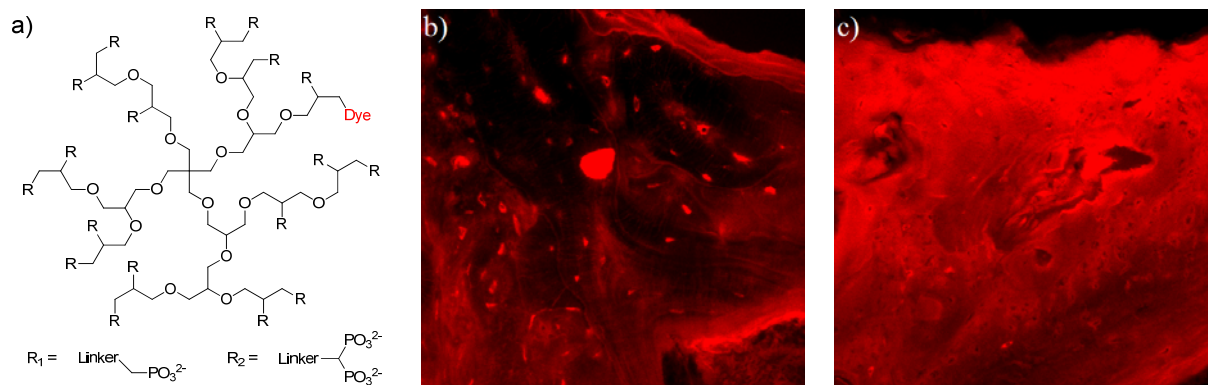
## IMPRS on Multiscale Biosystems

**Title:** Targeting Bone with Multifunctional Dendritic Polymer Derivatives

**PI:** Prof. Dr. Rainer Haag

**In collaboration with:** Prof. Dr. Peter Fratzl

**Project description:** The aim of this project is to investigate the interaction of dendritic polyglycerol (dPG) derivatives with bone *in vitro* and *in vivo*. Central aspects will be the synthesis and characterization of highly bone- and inflammation-specific stable and degradable multivalent polymers and their biological investigation. Recent studies indicate that fully synthetic dPG-based macromolecules provide potent bone targeting properties and are promising candidates for analytical applications. Utilizing the known specificity of dendritic polyglycerol sulfate (dPGS) towards inflamed tissue will in addition allow to investigate and alter inflammation-related biological processes on a molecular level. Since relatively less is known about the organization, cellular, and molecular dynamics of bone, polymer-based systems equipped with fluorophores or contrast-generating modalities (e.g. iodinated aromatics) represent ideal scaffolds to obtain fundamental, qualitative and quantitative knowledge about the structure and dynamics within bone and develop systems for various noninvasive imaging applications. For this project the interplay of chemical engineering, physicochemical characterization, and biological evaluation are from great importance.



Representative examples for a) multifunctional polyanion architectures and their interaction with murine bone. b) dPG phosphonate ( $R_1$ ) and c) dPG bisphosphonate ( $R_2$ ).

**Required background:** Distinct knowledge in organic and macromolecular chemistry, physicochemical purification processes (dialysis, ultrafiltration, SEC, HPLC etc.), and basic knowledge in physical characterization techniques (NMR, GPC, IR, DLS, EM, MS, etc.).

**Paper to read before the interview:** M. A. Quadir, R. Haag, Biofunctional nanosystems based on dendritic polymers, *Journal of Controlled Release* **2012**, *161*, 484–495.

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