

# Synthesis of amphiphilic graft copolymers composed of PIP backbone & polyol graft chains

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## Abstract

The aim of this research project was to synthesise new associative graft copolymers based on a hydrophobic polyisoprene backbone and hydrophilic graft chains such as Pluronics, PEG or mixed grafts of both. The main project was carried out using a “*grafting onto*” approach by reacting of one hydroxyl end group of the polyols with pendant acid functionalities of the LIR-10 backbone (LIR-10 is commercial product based on polyisoprene, which backbone is modified with 10 acid functionalities). Since PEG and Pluronics are bi-functional polymers, this esterification can repeat itself on a neighbouring LIR-410 molecule thus creating a cross-link. By using in high molar excess the amount of the polyol to the functionalities of LIR-10 in the reaction mixture it was possible to form non-crosslinked products. Four main products were prepared:

- Grafted LIR-410 with PEO (PIP-g-PEO);
- Grafted LIR-410 with Pluronic (PIP-g-Pluronic);
- Grafted LIR-410 with mixtures of PEO and Pluronic in two different ratios of PEO/ Pluronic, (PIP-g-PEO/Pluronic)

Products were characterised by high resolution  $^1\text{H}$  NMR and diffusion NMR spectroscopy. The results obtained by diffusion NMR showed that around 52% of the PEG and 22% of the Pluronic samples are grafted to the backbone. The associative behaviour of the copolymers with different graft compositions was investigated in a range of solvents by DLS. Solvents were chosen which were either a good solvent for the backbone (hexane) or the graft chains (methanol and water). It proposed formation of crew-cut micelles in methanol and water, and flower micelles in hexane.