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Determination and prediction of VLE data in polymer-solvent systems. Part 2

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Transport of oil products, namely crude oil, gas condensate and derivatives, requires flow improver additives for optimal realization. These compounds, already in low concentrations, are able to improve significantly flow properties of transported material. It was found [1, 2] that one class of efficient additives consists of copolymers and terpolymers synthesized by polymerization of long chain acrylate (ODA) with styrene (St) and acrylic acid (AA) and St or 1-vinyl-2-pyrrolidone (1V2P).

Chemical structure of the synthesized compounds is shown in Fig. 1.

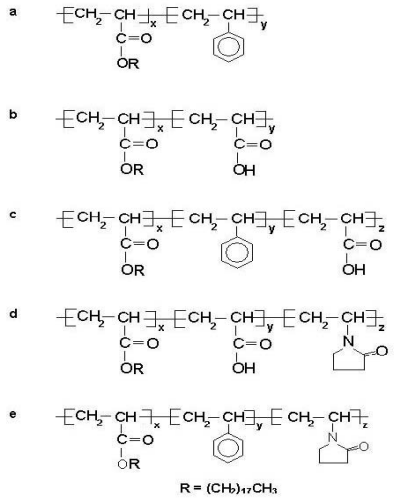

Fig. 1. Structural representation of a) copolymer of ODA-St; b) copolymer of ODA-AA; c) terpolymer of ODA-St-AA; d) terpolymer of ODA-AA-1V2P; e) terpolymer of ODA-St-1V2P

Such polymeric improver additives have already been exploited with excellent results as the means for separation of paraffinic fractions and their effect on the pour point and rheological properties of crude oil samples in the northern Croatia.

For future development of better additives, the group contribution method represents a powerful tool; however the evaluation of particular group increments must be based on thermodynamic data on systems which are not hitherto available. The five structurally different additives, poly(ODA$_{0.85}$-St$_{0.15}$), poly(ODA$_{0.95}$-AA$_{0.05}$), poly(ODA$_{0.82}$-St$_{0.05}$-AA$_{0.13}$), poly(ODA$_{0.79}$-AA$_{0.11}$-1V2P$_{0.10}$), poly(ODA$_{0.78}$-St$_{0.05}$-1V2P$_{0.17}$ were selected for vapor–liquid equilibrium (VLE) measurement because they decrease considerably pour point of all crude oils, i.e. they are improving rheological properties of crude oils.

In this work, VLE were determined ebulliometrically by the micromethod described in [3] in toluene as solvent, at different temperatures and pressures. Prediction of phase equilibrium compositions will be carried out with use of both the Entropic-FV model [4] and the GC-Glory EOS [5] group contribution models. The results will be completed shortly before the conference and shown during the presentation.

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