



Easy preparation of specialty polymers containing poly(acrylic acid)

PAA, what you may know ..

Poly(acrylic acid) (PAA) is a well-known polymer in a high number of bulk applications because of two of its main properties:

- **extreme water absorption because of the ionic nature** of PAA (e.g. diapers);
- **interaction with metal ions** (e.g. adhesion to metal substrates such as copper, zinc, aluminium).

PAA, high tech material

An increasing part of *high tech polymer materials* introduce PAA as segments in **well-defined polymer structures**. These can be block copolymers, polymer brushes, star polymers etc., depending on the desired property and functionality.

PAA segments are therefore combined with other polymers like polyacrylates, polyacrylamides, polystyrene and polyethers. The resulting multicomponent-material combines the main properties of the individual polymers such as crystallinity, visco-elasticity and mechanical properties. This opens up high perspectives for new materials with tailored properties.

Novel technology...

The Polymer Chemistry Research Group (www.filipduprez.com) at Ghent University developed a new synthetic route for polymers containing PAA segments, opening up opportunities for both **new products and new processes for existing PAA-containing polymers**.

Controlled radical polymerization techniques such as RAFT and ATRP were used to synthesize well-defined poly(ethoxyethyl(meth)acrylate) (PEE(M)A). This was demonstrated by kinetic data, control of molecular weight and the presence of a low molecular weight distribution. Additionally, working examples demonstrate the synthesis of block copolymer structures containing PEE(M)A.

PEE(M)A is an amorphous hydrophobic polymer and is a precursor for PAA. This allows the preparation of PAA-containing polymers under **hydrophobic conditions**. A simple heating step (> 70 °C) quantitatively transforms PEE(M)A into PAA by release of a gas.

Industrial opportunities

- New products
 - Wide range of new well-defined PAA-containing polymers
 - New polymer structures and morphologies
 - "On-the-spot" conversion of hydrophobic prepolymer to hydrophilic PAA
- New process for existing PAA products
 - Use of hydrophobic polymer precursor
 - Easy conversion to PAA



Application domains

PAA containing polymers are used in a wide field range, demonstrated in the list below.

- ▶ Nanotechnology
- ▶ Lithography
- ▶ Textile (+ carpets, leather)
- ▶ Water treatment (flocculants)
- ▶ Paints
- ▶ Cosmetics and Personal care
- ▶ Thermoplastics (shoes, glass, metals, cables and wires, insulation, adhesives)
- ▶ Pharmaceuticals (drug delivery)

Intellectual Property Rights

Subject of patent application WO2006002496.

Desired type of collaboration

- ▶ Research collaboration
- ▶ Joint application development
- ▶ Licensing opportunity

Keywords

- *poly(acrylic acid), PAA*
- *smart materials*
- *pH-responsive*
- *controlled radical polymerization*
- *block copolymers*
- *amphiphilic*
- *metal ion interaction*
- *polymer precursor*

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