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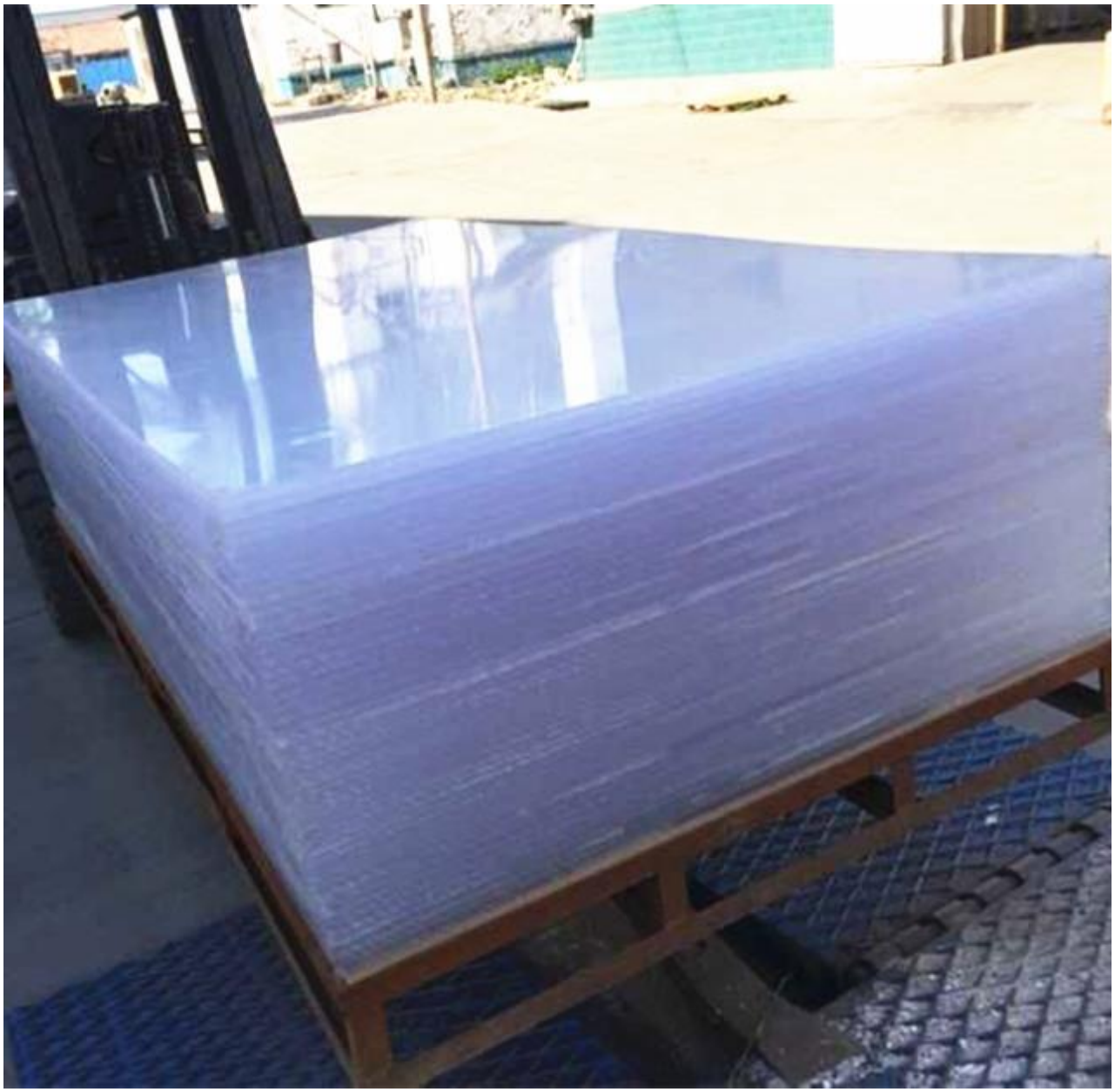
Polymeric insulating materials based on methacrylic copolymers.

Brief overview



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Introduction

Waterproofing materials based on methacrylic copolymers are an innovative solution and the optimal choice for protecting industrial facilities: floors, expansion joints, concrete and metal structures in aggressive operating conditions.

MMA (methyl methacrylate) systems are synthetic reactive oligomers based on methyl methacrylate, which, when mixed with an initiator (hardener), quickly polymerize at room temperature, forming strong, chemically resistant and durable polymer coatings or composites.

MMA's chemical formula is $C_5H_8O_2$. **Chemical category:** reactive (curable) polymer systems. They are supplied as two components (base + hardener) that undergo a radical polymerization reaction when mixed.

The main components of MMA systems:

- **Methyl methacrylate (MMA) –** the main monomer, providing low viscosity (good flow and penetration) before curing and high strength after curing.
- **Copolymers/oligomers –** impart elasticity, adhesion, and impact strength to the final material.
- **Initiator (hardener) –** initiates the polymerization reaction.

Mechanism of action: Unlike materials that dry through the evaporation of water or solvent (cements, bitumens), methacrylic systems harden through an irreversible chemical reaction. The monomer and oligomer molecules are cross-linked into a dense three-dimensional polymer network.

Methacrylic systems offer **key advantages:** seamlessness (for liquid types), high elasticity, rapid polymerization, high tensile and abrasion strength, excellent adhesion to wet concrete, resistance to temperature cycles, and durability.

Types of polymer MMA systems:

- **Sheet membranes (roll)**
  - **PVC membranes -** sheets made of plasticized polyvinyl chloride, reinforced with mesh, which are hot-air welded into a single sheet
  - **TPO membranes -** thermoplastic polyolefins based on polypropylene and ethylene-propylene rubber
  - **EPDM membranes** made of synthetic rubber, installed with adhesive or special fasteners
- **Liquid compounds (coating and spray waterproofing)**
  - **Polyurethane mastics and compounds,** one- or two-component
  - **Acrylic compounds** (polymer dispersions), usually water-based
  - **Liquid rubber** based on bitumen-polymer emulsions (with latex)
  - **Cement-polymer compounds (flexible cement mixtures)** - dry cement mixtures with the addition of polymer additives
- **Penetrating and injection waterproofing** (low-viscosity resins (acrylate, polyurethane, epoxy), which are injected under pressure into the thickness of concrete or into cracks, polymerizing inside, filling the voids and creating a waterproofing barrier.

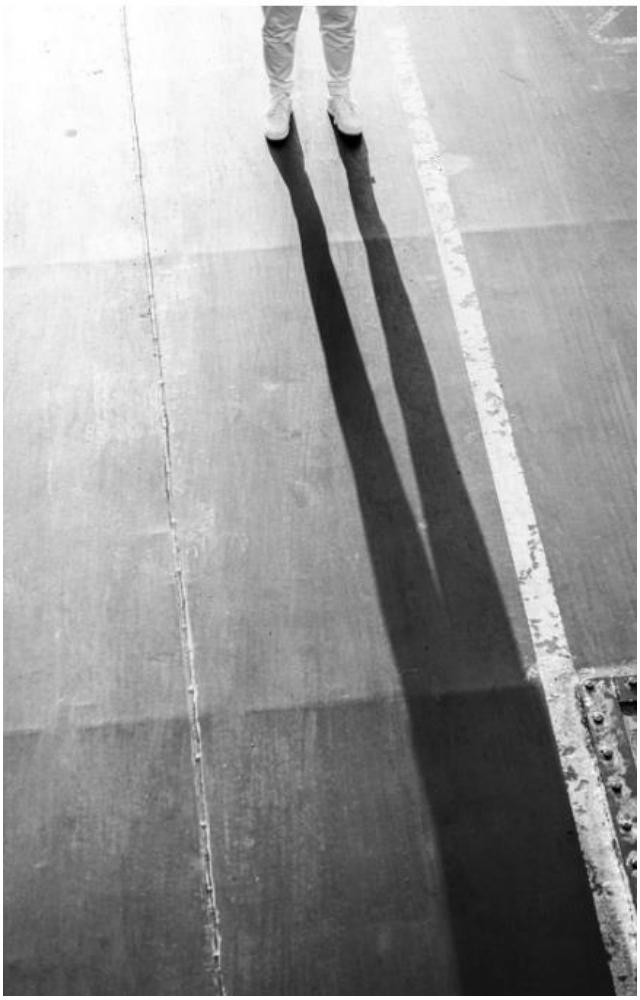
Part 1.

Materials in the form of sheets and building mixtures

Let's take a closer look at METACRYL-based materials in the form of sheets and building mixtures presented in the EU and US markets, examining the main characteristics, properties, transportation and storage conditions, as well as key manufacturers.

1.1. Main consumer properties

- Highly waterproof and water-resistant
- Fast curing (for building mixtures): strength gain in 15–60 minutes.
- Elasticity and crack-bridging properties even at low temperatures (down to –30°C), preventing cracking due to structural deformation.
- Mechanical strength: high wear and impact resistance.
- Chemical resistance, resistance to oils, alkalis, acids, and aggressive operational environments.
- High adhesion to concrete, metal, and other building substrates.
- Wide temperature range (from –40°C to +120°C).
- Resistance to UV radiation, acids, alkalis, oils, and solvents.
- Vapor permeability: allows structures to "breathe," preventing accumulation.
- Environmentally friendly after curing: does not emit harmful substances.
- Durability: service life up to 25-30 years
- Sheet materials are often reinforced with polyester or fiberglass mesh for increased strength and tear resistance



1.2. Dimensions/packaging

Standard sizes of MMA-based sheet waterproofing materials:

- Width: 1.0 – 2.1 m
- Length: 10 – 30 m (in rolls)
- Thickness: 1.0 – 2.5 mm (custom solutions up to 3.0 mm are available)

Liquid (pourable, sprayable) MMA compounds:

The material is supplied as two components (resin and hardener) in drums or buckets.

- Packaging: Container volume. Standard kits are two-barrel kits of 20 kg, 25 kg, or 30 kg of each component. Smaller buckets are also available for repair work (e.g., 5-10 kg).

- Key parameter: Layer thickness: The standard recommended coating thickness is from 1.5 to 4 mm. This parameter (and not the length/width) is the primary one for calculating consumption. Consumption: On average, to obtain a 2 mm layer, 2.5 - 3.5 kg/m² is required, depending on the specific composition and substrate.

1.3. Transportation and storage conditions

- Storage temperature: from +5°C to +30°C.
- Relative humidity: no more than 70%.
- Storage: in dry, ventilated areas, in the original packaging, away from heat sources and direct sunlight.
- Shelf life: Sheet materials - up to 24 months, dry building mixes - 12 months, two-component methacrylate compounds - 6-12 months (depending on packaging and stabilizers).
- Transportation: permitted at temperatures from -10°C to +40°C, without sudden temperature changes or mechanical damage.

1.4. Manufacturers in the EU and the USA

EU:

- Sika AG (Switzerland/EU) — Sikaplan® and Sikalastic® methacrylate-based product lines.
- BASF Construction Solutions (Germany) — MasterSeal® series.
- Mapei SpA (Italy) — Mapelastic Smart and other two-component methacrylate systems.
- Fosroc International (UK, active in the EU) — Nitoproof and Nitoflor methacrylate-based coatings.
- Renolin / RPM International (Germany)- Renolin MMA systems (e.g. Renolin 700, Renolin 710)
- Technologics / Derbigum (Belgium)- Product line: Derbigum Sprit MMA and Derbigum Nano M.

USA:

- GCP Applied Technologies (formerly part of W.R. Grace) — PREPRUFE® and BITUTHENE® series with methacrylate modifications.
- Tremco Incorporated — Vulkem® and Tremproof® waterproofing membranes and compounds.
- RPM International Inc. (through subsidiary brands: Stonhard, Flowcrete) — industrial polymer floors and joint sealants based on methacrylate.
- BASF Corporation (USA) — similar MasterSeal® products adapted to ASTM and ACI standards.
- Polycoat Products, Inc. Product line: Various MMA systems under the company's trademarks.
- VersaFlex / Sherwin-Williams. Product line: VersaFlex MMA systems (e.g. VF-MMA).
- Key Resin Company. Product Line: Key MMA Systems

Part 2

Paints and varnishes based on acrylic or vinyl polymers in a non-aqueous medium (solvent-based)

2.1. Consumer properties

- High penetrating power – seals microcracks and pores in concrete.
- Chemical resistance – resistant to oils, weak acids, alkalis, and detergents.
- Quick drying – 1–3 hours before re-application, 6–12 hours before use.
- Gloss or semi-matte finish – improves visual inspection of the floor's condition.
- Compatibility with subsequent coatings – can serve as a primer for epoxy or polyurethane systems.
- Limitations: not recommended for continuous contact with water (unlike sheet membranes); requires ventilation during application due to solvents.

2.2. Delivery and packaging

- Available in metal or plastic cans of 1 liter, 5-liter, 10 liters, and 20-liter capacity.
- Two-component systems include a hardener (often methacrylate-based).
- One-component systems are ready to use after mixing.

2.3. Transportation and Storage Conditions

- Storage temperature: +10°C – +25°C.
- Avoid freezing and excessive heat (>40°C).
- Store in tightly closed containers to prevent solvent evaporation and premature polymerization.
- Shelf life: 12 months (single-component), 6–9 months (two-component).
- Transportation: Hazard class: flammable liquids, requires compliance with ADR/DOT standards..

2.4. Manufacturers

EU:

- AkzoNobel (Netherlands) — Interpon and Sikkens industrial coatings with methacrylate-modified acrylics.
- PPG Industries Europe — SIGMA COATINGS line for industrial floors.
- Hempel A/S (Denmark) — Hempadur and Hempel Floor Systems.
- Caparol (Germany) — specialized acrylic solvent-based varnishes for industrial applications.

USA:

- Sherwin-Williams — Floor Shield® and Macropoxy® series with acrylic-methacrylate components.
- PPG Industries (USA) — PSX® and Amerlock® coatings.
- Rust-Oleum Corporation — Industrial Choice and EpoxyShield Professional (including modified acrylics).
- Koppers Performance Chemicals — KOP-R-SILANE and related products with water-repellent and protective properties.

Sources

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