What is claimed is:

1. A process for the continuous production of halogenated butyl rubber, the process comprising at least the steps of:
   a. providing a butyl rubber slurry comprising butyl rubber and water;
   b. dissolving the butyl rubber of the butyl rubber slurry in a non-halogenated organic solvent to form a butyl rubber cement in water;
   c. phase separating the water from the rubber cement in a closed separator, thereby forming an interface layer in the separator; and,
   d. halogenating the rubber cement to thereby produce the halogenated butyl rubber.

2. The process according to claim 1, wherein step a. is carried out continuously.

3. The process according to claim 1 or 2, wherein steps b. and c. take place in the same closed vessel.

4. The process according to claim 3, wherein the vessel is divided into a closed dissolving zone, wherein step b. takes place, and a closed separator zone, wherein step c. takes place.

5. The process according to claims 3 or 4, wherein flow through the vessel is substantially horizontal.

6. The process according to any one of claims 3 to 5, wherein the closed dissolving zone and closed separator zone are laterally adjacent to one another.

7. The process according to any one of claims 1 to 6, wherein the process further comprises recycling a portion of the rubber cement to the closed separator in order to disrupt the interface layer.

8. The process according to any one of claims 1 to 7, wherein the rubber slurry concentration comprises from greater than 5% up to 20% by weight of butyl rubber in water.

9. The process according to any one of claims 1 to 8, wherein the rubber cement comprises from greater than 5% up to 30% by weight of butyl rubber.

10. The process according to any one of claims 1 to 9, wherein the non-halogenated organic solvent comprises at least 80 wt.-% of one or more non-halogenated aliphatic hydrocarbons having a boiling point in the range of 25°C to 100°C at a pressure of 1013 hPa, preferably at least 90 wt.-%, even more preferably at least 95 wt.-% and yet even more preferably at least 99 wt.-%, the remainder being other non-halogenated hydrocarbons.

11. The process according to any one of claims 1 to 10, wherein the non-halogenated organic solvent is selected from the group consisting of n-pentane, isopentane, n-hexane, 2-methylpentane, 3-methylpentane, 2,3-dimethylbutane, 2,2-dimethylbutane, cyclohexane, methylcyclohexane, and methylcyclopentane, n-heptane, 2-methylhexane, 3-methylhexane, 2,2-dimethylpentane, 2,3-dimethylpentane, 2,4-dimethylpentane, 3,3-dimethylpentane, 3-ethylpentane, and 2,2,3-trimethylbutane.

12. The process according to any one of claims 1 to 11, wherein the butyl rubber comprises a C_4 to C_7 isomonoolefin monomer, preferably comprising isobutylene, and a C_5 to C_{11} conjugated aliphatic diene monomer, preferably comprising isoprene.

13. The process according to claim 12, wherein the butyl rubber further comprises one or more co-polymerizable alkyl-substituted vinyl aromatic co-monomers.

14. An apparatus for the production of a butyl rubber cement from a butyl rubber slurry, the cement comprising butyl rubber in a non-halogenated organic solvent and slurry comprising butyl rubber in water, the apparatus comprising:

a) a closed dissolving zone configured for receiving the butyl rubber slurry and the non-halogenated organic solvent, the dissolving zone comprising mixing means for agitating the slurry and the solvent, the butyl rubber dissolving in the solvent to form the butyl rubber cement in water; and,

b) a closed separator zone horizontally adjacent to the dissolving zone, the separator zone facilitating phase separation of the butyl rubber cement from the water by formation of a water layer vertically spaced apart from a cement layer across an interface layer, the separator zone comprising a substantially horizontal flow path and having at least two outlets vertically spaced apart by a distance sufficient to separately collect the water layer and the cement layer.

15. The apparatus according to claim 14, wherein the separator zone further comprises mixing means extending into the interface layer to agitate and disrupt the interface layer.

16. The apparatus according to claim 15, wherein the mixing means comprises a fluid conduit for introducing rubber cement into the interface layer.

CLAIMS

1. An invention not claimed in any divisional application.