

ELECTROCHEMICAL ACTIVATION

CONTENTS

<u>Preface</u>	<u>9</u>
<u>Introduction</u>	<u>10</u>
<u>Chapter 1. Theoretical concepts and hypotheses about the nature of electrochemical activation</u>	<u>13</u>
<u>1.1. Early publication of the electrochemical activation nature</u>	<u>13</u>
<u>1.2. Activated substance. Some questions of theory and practice</u>	<u>13</u>
<u>1.3. Chemicals and drilling fluids electrochemical activation</u>	<u>19</u>
<u>1.4. The mechanism of change of activated substances reactivity</u>	<u>22</u>
<u>1.5. The physical nature of the activation substances phenomena</u>	<u>30</u>
<u>1.6. The nature of the electrochemical activation of environment</u>	<u>34</u>
<u>2.</u>	
<u>Chapter 2. Electrochemically activated water and solutions experimental studies</u>	<u>37</u>
<u>2.1. Uncommon effects as experimental studies catalysts</u>	<u>37</u>
<u>2.2. The connection between the water physical and chemical parameters and the electrochemical effects conditions (fragments of the dissertation research)</u>	<u>40</u>
<u>2.3. Indirect researches of the electrochemical activation mechanism</u>	<u>60</u>
<u>2.3.1. Investigation of the EMF (electromotive force) of the galvanic pile</u>	<u>60</u>
<u>2.3.2. Investigation of the subjected to electrostatic action water parameters</u>	<u>62</u>
<u>2.3.3. Research of noncontact electrochemical activation</u>	<u>63</u>
<u>2.3.4. Investigation of the electroactive water influence on catalase force in leaves</u>	<u>66</u>
<u>2.3.5. Getting dehydrogenation catalysts paraffinic hydrocarbons: butane and isopentane</u>	<u>66</u>
<u>2.3.6. Getting dimethyldioxane decomposition catalyst (DMD)</u>	<u>66</u>
<u>2.3.7. Emulsion polymerization of butadiene and styrene</u>	<u>67</u>
<u>2.3.8. Increasing the effect of surfactant action</u>	<u>67</u>
<u>2.4. Experimental research of the process of electrochemically activated water obtaining and its parameters</u>	<u>68</u>
<u>3. Fds</u>	
<u>Chapter 3. General idea of the technique and technology of electrochemically activated substances synthesis</u>	<u>73</u>
<u>3.1. Electrochemical activation: basic concepts and definitions</u>	<u>73</u>
<u>3.2. FEM and MB reactors: engineering ideology, characteristics, models range</u>	<u>87</u>
<small>FEM – flow-through electrochemical module elements. MB – flow-through electrochemical module elements of new generation – Bakhir Modules.</small>	
<u>4.</u>	
<u>Chapter 4. Selected inventions</u>	<u>103</u>
<u>4.1. Electrochemical reactors and technical electrochemical systems</u>	<u>104</u>

<u>4.1.1. First inventions</u>	<u>104</u>
<u>4.1.2. Device for controlling the drilling fluid parameters</u>	<u>109</u>
<u>4.1.3. Device for water electrical treatment</u>	<u>112</u>
<u>4.1.4. Portable device for fluid electrical treatment</u>	<u>117</u>
<u>4.1.5. Device for fluid electrochemical treatment</u>	<u>119</u>
<u>4.1.6. Device for fluid electrochemical treatment</u>	<u>121</u>
<u>4.1.7. Device for fluid unipolar electrical treatment</u>	<u>121</u>
<u>4.1.8. Device for fluid unipolar treatment</u>	<u>122</u>
<u>4.1.9. Device for liquids electrochemical treatment</u>	<u>122</u>
<u>4.1.10. Household electroactivator</u>	<u>122</u>
<u>4.1.11. Device for hemodialysis</u>	<u>123</u>
<u>4.1.12. The Electrochemical treatment of water and device for electrochemically treating water</u>	<u>124</u>
<u>4.1.13. Device for electrochemical water treatment</u>	<u>125</u>
<u>4.1.14. Device for electrochemical water treatment</u>	<u>126</u>
<u>4.1.15. Device for water disinfection and purification</u>	<u>127</u>
<u>4.1.16. Portable device for fluid electrochemical treatment</u>	<u>127</u>
<u>4.1.17. Device for water electrochemical treatment</u>	<u>128</u>
<u>4.1.18. Apparatus for water electrochemical treatment</u>	<u>128</u>
<u>4.1.19. Device for fluid electrochemical treatment</u>	<u>129</u>
<u>4.1.20. Device for water electrochemical treatment – FEM-3 item</u>	<u>129</u>
<u>4.1.21. Device for detergent and disinfectant production</u>	<u>131</u>
<u>4.1.22. Device for detergent and disinfectant production</u>	<u>131</u>
<u>4.1.23. Device for detergent and disinfectant production</u>	<u>132</u>
<u>4.1.24. Device for water and aqueous solutions electrochemical treatment</u>	<u>134</u>
<u>4.1.25. Device for water electrochemical treatment</u>	<u>134</u>
<u>4.1.26. Device for water electrochemical treatment</u>	<u>135</u>
<u>4.1.27. Apparatus for acquisition of alkali or alkaline-earth metals anodic oxidation chloride solution products</u>	<u>135</u>
<u>4.1.28. Apparatus for water and/or aqueous solutions electrochemical purification</u>	<u>137</u>
<u>4.1.29. Apparatus for endoscopes cleaning and sterilization</u>	<u>137</u>
<u>4.1.30. Apparatus for water and/or aqueous solutions electrochemical treatment</u>	<u>138</u>
<u>4.1.31. Reactor for fluid electrochemical treatment</u>	<u>138</u>
<u>4.1.32. Reagent-free way to change the physicochemical properties of water and/or aqueous solutions</u>	<u>139</u>
<u>4.1.33. Electrochemical modular cell for treatment of aqueous solutions, apparatus for acquisition of alkali or alkaline-earth metals anodic oxidation chloride solution products – FEM-7 item</u>	<u>140</u>
<u>4.1.34. Portable device for fluid electrochemical treatment</u>	<u>141</u>
<u>4.1.35. Portable device for fluid electrochemical treatment</u>	<u>142</u>
<u>4.1.36. Apparatus for the water disinfection in swimming pools</u>	<u>142</u>
<u>4.1.37. Apparatus for oxidants aqueous solution production</u>	<u>143</u>
<u>4.1.38. Apparatus for drinking water treatment</u>	<u>143</u>
<u>4.1.39. Apparatus for drinking water treatment</u>	<u>144</u>
<u>4.1.40. Apparatus for acquisition of alkali or alkaline-earth metals anodic oxidation chloride solution products</u>	<u>144</u>
<u>4.1.41. Electrochemical modular cell for treatment of aqueous solutions, apparatus for acquisition of alkali or alkaline-earth metals anodic oxidation chloride solution products</u>	<u>144</u>
<u>4.1.42. Apparatus for oxidants aqueous solution production</u>	<u>145</u>
<u>4.1.43. Electrochemical cell for electrolytes solutions processing</u>	<u>145</u>
<u>4.2. Electrochemical activation at the production, transportation and of oil and gas processing</u>	<u>147</u>

<u>4.2.1. Controlling method of drilling mud physicochemical properties</u>	<u>147</u>
<u>4.2.2. Method to displace oil from the productive stratum</u>	<u>147</u>
<u>4.2.3. Method to develop oil-bearing formation</u>	<u>148</u>
<u>4.2.4. Method for gas purifying from hydrogen sulfide</u>	<u>152</u>
<u>4.2.5. Method for natural gas purifying from hydrogen sulfide</u>	<u>153</u>
<u>4.2.6. Method for well cementing</u>	<u>156</u>
<u>4.2.7. Method for divinyl- / methyl / butadiene rubbers allocation</u>	<u>158</u>
<u>4.2.8. Method of cleaning pyrolysis furnace coil from chark</u>	<u>159</u>
<u>4.2.9. Method for lower olefins producing</u>	<u>159</u>
<u>4.2.10. Method for lower olefins and benzol producing</u>	<u>160</u>
<u>4.2.11. Method for unsaturated hydrocarbons and benzol producing</u>	<u>160</u>
<u>4.2.12. Method for unsaturated hydrocarbons producing</u>	<u>161</u>
<u>4.2.13. Method for pipelines fluid corrosion attack protecting</u>	<u>161</u>
<u>4.2.14. Method for synthetic latex producing</u>	<u>162</u>
<u>4.2.15. Method of gases sulfur-containing impurities cleaning</u>	<u>163</u>
<u>4.3. Electrochemical activation in water purification and preparation systems</u>	<u>164</u>
<u>4.3.1. Method of scale removing from the heat-exchange system surface</u>	<u>164</u>
<u>4.3.2. Method of desalted water preparing</u>	<u>164</u>
<u>4.3.3. Method of water preparing to feed heat networks</u>	<u>166</u>
<u>4.3.4. Method of natural water softening</u>	<u>168</u>
<u>4.3.5. Method of water preparing for crop irrigation</u>	<u>170</u>
<u>4.3.6. Method of water and/or aqueous solutions physicochemical properties reagent-free changing</u>	<u>172</u>
<u>4.3.7. Method for drinking water treatment</u>	<u>173</u>
<u>4.3.8. Method for water treatment</u>	<u>178</u>
<u>4.4. Electrochemical activation in medicine and public health service</u>	<u>181</u>
<u>4.4.1. Method for biologically active properties liquid producing</u>	<u>181</u>
<u>4.4.2. Method for dialysis membranes purification</u>	<u>190</u>
<u>4.4.3. Method for remove protein contamination detergent solution producing</u>	<u>190</u>
<u>4.4.4. Method for detergent and sterilizing solution producing to clean and prepare reused biofilters</u>	<u>191</u>
<u>4.4.5. Method of hemofilter regeneration determination</u>	<u>192</u>
<u>4.4.6. Method of sorbent production</u>	<u>193</u>
<u>4.4.7. Method of immunohemosorbent producing</u>	<u>193</u>
<u>4.4.8. Device for toxic substances sorption from biological fluids</u>	<u>194</u>
<u>4.4.9. Device for hemodialysis</u>	<u>194</u>
<u>4.4.10. Method for monomer residual removing from methacrylic polymers</u>	<u>195</u>
<u>4.4.11. Method of microspheres regeneration used in Klinitron type hospital beds</u>	<u>196</u>
<u>4.4.12. Method of endoscopes cleaning and sterilizing</u>	<u>196</u>
<u>4.4.13. Method for premises disinfection</u>	<u>196</u>
<u>4.4.14. Method for disinfectant solution producing – Anolyte neutralium ank – p</u>	<u>197</u>
<u>4.4.15. Method for disinfectant solution producing – Anolyte neutralium</u>	<u>197</u>
<u>4.4.16. Method of water and/or aqueous solutions physicochemical properties reagent-free changing</u>	<u>198</u>
<u>4.4.17. Method for disinfectant solution producing and device for its realization</u>	<u>199</u>
<u>4.4.18. Disinfectant</u>	<u>200</u>
<u>4.4.19. Method for disinfectant preparing and disinfectant itself</u>	<u>200</u>
<u>4.4.20. Method of electrochemically activated disinfecting solution producing and apparatus for its realization</u>	<u>201</u>

<u>4.5. Electrochemical activation in various industry and agriculture fields</u>	<u>202</u>
<u>4.5.1. Cutting fluid for metals machining</u>	<u>202</u>
<u>4.5.2. Chemical copper coating solution</u>	<u>204</u>
<u>4.5.3. Circuit boards etching solution</u>	<u>206</u>
<u>4.5.4. Circuit boards cleaning composition</u>	<u>206</u>
<u>4.5.5. Method for lead batteries electrolyte preparation</u>	<u>206</u>
<u>4.5.6. Method for concrete mix composition</u>	<u>208</u>
<u>4.5.7. Method for concrete mix composition</u>	<u>208</u>
<u>4.5.8. Method for lime slaking</u>	<u>210</u>
<u>4.5.9. Method for ceramic ware producing</u>	<u>210</u>
<u>4.5.10. Method of producing cores and moulds mixture preparing</u>	<u>211</u>
<u>4.5.11. Detergent to clean metal surface</u>	<u>212</u>
<u>4.5.12. Laundry method and device for its realization</u>	<u>220</u>
<u>4.5.13. Method for agricultural poultry eggs treatment</u>	<u>222</u>
<u>4.5.14. Method for reducing retention plumage poultry carcasses before removing it</u>	<u>222</u>
<u>4.5.15. Method of poultry watering</u>	<u>222</u>
<u>4.5.16. Method of meat storing</u>	<u>223</u>
<u>4.5.17. Method of poultry keeping</u>	<u>225</u>
<u>4.5.18. Method for diffusion juice production</u>	<u>225</u>
<u>4.5.19. Method of sugar beet storing</u>	<u>226</u>
<u>4.5.20. Method of oxidized fats regeneration</u>	<u>226</u>
<u>4.5.21. Apparatus for deacidification of milk</u>	<u>230</u>
<u>4.5.22. Method of dry tea concentrate production</u>	<u>232</u>
<u>4.5.23. Method of malt production</u>	<u>233</u>
<u>4.5.24. Method for gelatinizing additive production</u>	<u>233</u>
<u>4.5.25. Starch hydrolysis method</u>	<u>234</u>
<u>4.5.26. Method of fur treatment</u>	<u>239</u>
<u>4.5.27. Method of pelage furs refining</u>	<u>240</u>
<u>4.5.28. Method of fur fell manufacturing</u>	<u>240</u>
<u>4.5.29. Method of citrus fruit storage</u>	<u>241</u>
<u>4.5.30. Method of poultry manure or dung treatment</u>	<u>242</u>
<u>4.5.31. Method of defoliant production for cotton treatment</u>	<u>243</u>
<u>4.5.32. Method for cotton seeds preplant treatment</u>	<u>246</u>
<u>4.5.33. Method for corn green mass preservation</u>	<u>249</u>
<u>4.5.34. Method for nitrogen fertilizers production</u>	<u>254</u>
<u>4.5.35. Method of biologically active liquid production</u>	<u>259</u>
<u>4.5.36. Material drying method</u>	<u>266</u>

5.

Chapter 5. Publications and publication fragments during the FEM and MB elements wide application period in technical electrochemical systems with various purpose

<u>5.1. Research results of the water purification efficiency in IZUMRUD (EMERALD) devices</u>	<u>267</u>
<u>5.2. Efficacy and safety of chemicals for disinfection, presterilizing clearing and sterilization</u>	<u>279</u>
<u>5.3. In search of an ideal antimicrobial agent</u>	<u>288</u>
<u>5.4. Anolyte PEROX: revolutionary new antimicrobial agent</u>	<u>292</u>
<u>5.5. AQUACHLOR devices: first steps</u>	<u>302</u>
<u>5.6. Electrochemical activation: the key to water treatment ecologically clean technology</u>	<u>309</u>

6.

<u>Chapter 6. Electrochemical activation in the drawings, diagrams and photographs</u>	<u>323</u>
<u>6.1. Theoretical aspects of electrochemical activation</u>	<u>325</u>
<u>6.2. Electrochemical reactors - the main tool of the electrochemical activation technology</u>	<u>329</u>
<u>6.3. STEL devices for electrochemically activated antimicrobial and cleaning solutions</u>	<u>342</u>
<u>6.4. STEL devices and electrochemically activated solutions in medicine, food industry and other human activities</u>	<u>351</u>
<u>6.5. AQUACHLOR devices: fundamentally new equipment and innovate technology of water sterilizing and purification</u>	<u>406</u>
<u>6.6. IZUMRUD (EMERALD) devices for water sterilizing, purification and conditioning</u>	<u>424</u>
<u>6.7. Specific development fragments</u>	<u>442</u>
<u>Chapter 7. History of the electrochemical activation technical systems development in photographs</u>	<u>449</u>
<u>Afterword</u>	<u>510</u>