Modern methods of SO₂ abatement

Catalytic methods leading to formation of elementary sulfur are the most prospective ways for substantial reduction of sulfur dioxide emissions. Sulfur is non-toxic product, no problems with transportation and storage. High demand of world market in sulfur. Current price is over 600 $ per metric tone.

The requirements to the catalysts to be developed:
- High temperature reduction of SO₂ with methane
  \[ \text{SO}_2 + \text{CH}_4 \rightarrow \text{S} + \text{H}_2 \text{O} + \text{CO} \]
- High thermal stability (the range of operating temperatures is 700-960°C)
- Resistance to coking

Low temperature reduction of SO₂ with syn-gas
\[ \text{SO}_2 + \text{H}_2\text{O} + \text{CO}_2 \rightarrow \text{H}_2 \text{S} + \text{H}_2 \]
High selectivity to sulfur
Suppression of formation of side products carbon disulfide, carbon sulfide oxide.

The enterprises of non-ferrous metallurgy are the main factor of environment pollution with sulfur dioxide
SO₂ is resulting from the roasting of non-ferrous ores
Typical emissions:
- ca. 1 000 000 tons of SO₂ per year (Polar Division of Open Joint Stock Company Mining and Metallurgical Company Norilsk Nickel - Russia)
- ca. 500 000 tons of SO₂ per year (Balkhash Mining and Metallurgical Company – Republic of Kazakhstan)

Laboratory set-up at BIC

Testing the catalysts performance in BIC pilot plant

Pilot plant for testing the catalysts under realistic conditions

Comparative analysis of process versions

<table>
<thead>
<tr>
<th>PROCESS CONDITIONS</th>
<th>SO₂ REDUCTION WITH METHANE</th>
<th>SO₂ REDUCTION WITH SYN-GAS</th>
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</thead>
<tbody>
<tr>
<td>Temperature, °C</td>
<td>910 + 960</td>
<td>400 + 600</td>
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<tr>
<td>Sulfur yield, %</td>
<td>60-65</td>
<td>&gt; 80</td>
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