

**Laval University**

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**From the Selected Works of Fathi Habashi**

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## Downes (1909-1996)

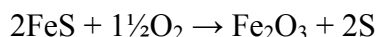
Fathi Habashi

## Downes (1909-1996)

I first met Kenneth William Downes in Ottawa at the Mines Branch in September 1960 when I joined as Postdoctoral Fellow in the Department of Mines and Technical Surveys. He was Head of the Extraction Metallurgy Division where I was assigned.

Downes was born in Manitoba, served in the Armed Forces during World War II, then graduated from McGill University in Montreal in 1947. In the same year, he joined the Mines Branch in Ottawa, where he conducted research on uranium ore, processing and gold extraction, and the recovery of chromium and manganese from low-grade Canadian ores which involved alkali roasting followed by leaching.

In the 1950s, there was great demand for elemental sulfur. Downes and co-worker R.W. Bruce devised, in 1955, a hydrometallurgical method under pressure at 120°C to transform nickel-containing pyrrhotite from the Sudbury region into iron oxide and elemental sulfur:



Pyrrhotite must be slurried in dilute acid and any nickel will be found in solution after reaction. The work was published in the *Transactions of the Canadian Institute of Mining & Metallurgy* **58**, 77–82 (1955). However, the sulfur shortage proved to be of short duration and the process was not applied industrially. Natural gas containing large amounts of H<sub>2</sub>S was discovered in Alberta, which solved the problem of sulfur supply.

In Summer 1962, he organized the Pressure Hydrometallurgy Session at the International Union of Pure and Applied Chemistry that was held in Montreal. He also created the Gold Metallurgy Group in January 1961 which later became the Mineral Processing Division of the Metallurgical Society of CIM which always holds its meetings in Ottawa in January. Downes retired in 1974.

Downes and Bruce method for treating pyrrhotite concentrates found application by INCO (now Vale) in 2016 after the discovery of Voisey's Bay nickel sulfide deposit earlier. Elemental sulfur is formed together with iron oxide while nickel goes into solution and can be recovered by electrowinning after solution purification by solvent extraction. INCO first thought of shipping the concentrate to Sudbury for smelting but the refusal of the authorities in Newfoundland forced building a plant in the region. This became the first hydrometallurgical plant for nickel sulfides.



Nickel processing plant in Newfoundland