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Multi Blending Technology (MBT): mineral processing method for increasing added value of marginal reserve

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Abstract. Indonesia’s position on the path of ring of fire makes it rich in mineral resources. Nevertheless, in the past, the exploitation of Indonesian mineral resources was uncontrolled resulting in environmental degradation and marginal reserves. Exploitation of excessive mineral resources is very detrimental to the state. Reflecting on the occasion, the management and utilization of Indonesia’s mineral resources need to be good in mining practice. The problem is how to utilize the mineral reserve resources effectively and efficiently. Utilization of marginal reserves requires new technologies and processing methods because the old processing methods are inadequate. This paper gives a result of Multi Blending Technology (MBT) Method. The underlying concept is not to do the extraction or refinement but processing through the formulation of raw materials by adding an additive and produce a new material called functional materials. Application of this method becomes important to be summarized into a scientific paper in a book form, so that the information can spread across multiple print media and become focused on and optimized. This book is expected to be used as a reference for stakeholder providing added value to environmentally marginal reserves in Indonesia. The conclusions are that Multi Blending Technology (MBT) Method can be used as a strategy to increase added values effectively and efficiently to marginal reserve minerals and that Multi Blending Technology (MBT) method has been applied to forsterite, Atapulgite Synthesis, Zeoceramic, GEM, MPMO, SMAC and Geomaterial.

1. Introduction

Indonesia’s position on the path of ring of fire makes it rich in mineral resources although its utilization and management have not been done properly, correctly and continuously [1–3]. In the past, metallic mineral resources have been mined, exported in raw conditions and inflicted a financial loss. Another negative impact happens such as a potential for environmental degradation, improvidence mineral resources. Marginal reserves are neglected reserves because of their low potentials in terms of both quantity and quality. Non-metallic minerals and rocks are generally used in Indonesia. Although non-metallic minerals and rocks are not as important as metal minerals, their role is significant in mining life particularly to support domestic economic activity [1,3].

The impact of uncontrolled exploitation of mineral resources causes environmental damage and depletion of reserve volumes and marginal reserves. Indonesian government should be wise in exploiting natural resources. Besides having mineral and energy resources, Indonesia is also overwhelmed by human resources that need to be equipped with the power of innovation, competitiveness, work and information literacy. Both are a combination of powerful resources that can make the people of Indonesia prosperous. The Government of Indonesia issued a policy on added value mandated through the Law of the Republic of Indonesia No 4 in 2009. Implementation of further added value added is regulated in Government Regulation of the Republic of Indonesia No. 24 in 2010
and Regulation of the Minister of Energy and Mineral Resources of the Republic of Indonesia No. 08 Year 2012. The increase of added value is intended to prevent the export of minerals in raw conditions and to break the import of raw materials of a national mineral-based industry through processing and refining of minerals in the country.

Processing and purifying minerals that are both technically and economically profitable are often referred to as beneficiation processes. Beneficiation can be done by utilizing the difference of mineral component parameters both physical, mechanical, chemical and combinations. Beneficiation aims to improve the quality of minerals to meet global market requirements. Although sometimes in raw conditions or only a small amount of processing such as blending, washing or measurement is already sold. As a result of excessive exploitation is now left with marginal reserves. Utilization of marginal reserve mineral resources required new technologies and processing methods that are immediately sought a solution.

2. Multi Blending Technology (MBT) Method

The management and utilization of marginal reserves, including low-grade minerals and minerals for mining production, require effective and efficient processing and purification technologies. As mandated by both the law and its derivative regulations, the increase of added value can be done through processing and refining. The results of studies on refining and processing both domestically and in non-block and other developing countries still revolve around the use of physical and chemical properties of minerals to improve quality to meet export requirements [4–6].

Transformation beneficiation technology (such as simple procedure and low cost operational) is necessary. The current deficiencies are inadequate, therefore new technologies and methods are required. Innovation of Multi Blending Technology (MBT) method that mineral beneficiation involving engineering technology. Multi Blending Technology (MBT) is mineral processing method using multi formula, multi-material, and multi-process so it will produce new material (Figure 1). The underlying concept is not to perform processing or purification to improve the quality but to produce new material in functional material form product, so the utilization of mineral resources becomes effective and efficient [7–9].

[Figure 1. Flow Chart of Multi Blending Technology (MBT) Method.]

Application of Multi Blending Technology (MBT) methods that have been done (Figure 2) include:

- Forsterite; the underlying concept is to formulate serpentinite, magnesite and rice husk ash to be forsterite as refractory.
• Atapulgite Synthesis; the underlying concept is to convert amorphous pearlite rocks into crystalline (prismatic monoclinic) rocks in an autoclave in reference to hydrothermal diastasis occurring in nature [7, 10, 11].
• Zeoceramic; the underlying concept is the physical properties of zeolites in the form of the ability of zeolites to absorb and pass the water to be used as a matrix in the manufacture of ceramics [12, 13].
• Ground Enhancement Material (GEM); the underlying concept is the ability of the material to act as a conductor when fed by high voltage (lightning strike) and that it can also act as an insulator [11, 14] when there is a reverse current (reflected) low.
• Surfactant Modified Activated Carbon (SMAC); the concept is to change the surface properties of activated carbon by modification with surfactant (EDA) to bind selectively to CrVI metal ions [15].
• Micro-organism Preservation Materials (MPMO); the underlying concept is the ability of these materials as a medium to isolate bacteria bacilluslicheniformis [16].
• Geomaterial (Geopolymer); the underlying concept is the polymerization process between silica and alumina to the OH group to form silanol so that there is a concrete bond without cement [17].

Although, the method is not applied to all type of minerals and rocks, utilizations of mineral resources effectively and efficiently than the last method. MBT has formulated and there’s no tailing result. Multi Blending Technology (MBT) Method can be used as a strategy to increase the added value of marginal reserve minerals including minerals from a mining product (waste). Indonesia will not export raw materials (mineral commodities) any longer if Multi Blending Technology (MBT) Method is successful and added value is implemented optimally. This summarizes expected to be useful for all parties, especially for the next generation who are involved in mineral processing. This paper is also expected to be used as a reference for the stakeholder in providing value-added minerals that are environmentally sound in Indonesia.

Figure 2. Prototype product of functional material.

3. Conclusions
Multi Blending Technology (MBT) Method can be used as a strategy to increase added value effectively and efficiently to marginal reserve minerals. Multi Blending Technology (MBT) method have been applied to forsterite, Atapulgite Synthesis, Zeoceramic, GEM, MPMO, SMAC dan Geomaterial.
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